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ADDRESS TO THE ROYAL GEOGRAPHICAL SOCIETY.*

By CLEMENTS R. MARKHAM, C.B., F.R.S., President.

During the last year there has been exceptional activity among geographers, both in the field and in the study. In the Arctic Regions our gold medallist, Fridtjof Nansen, is still, we hope and believe, pushing his daring expedition onward into the unknown. Mr. Jackson and his companions have wintered on the shores of Franz Joseph Land, and are about to commence their exploring work. Lieut. Peary is still engaged on his Greenland enterprise; and Baron Toll has made known the exceedingly valuable results of his visit to the New Siberia islands. As regards Asia, Mr. and Mrs. Bent have just returned from their interesting journey into the interior of Arabia. Dr. Sven Hedin and Mr. Littledale are still engaged in the difficult task of exploring the unknown parts of Tibet; while our Vice-President and gold medallist, Mr. George Curzon, has explored the Pamirs, determined the true source of the Oxus, and made a very remarkable journey through Afghanistan. Among our African travellers Mr. Weld Blundell has returned from Cyrenaica, Dr. Hinde from his exploration of the Lukuga outlet of Lake Tanganyika, Mr. Scott Elliot from his very important examination of the Ruwenzori region, and Dr. Donaldson Smith is still persevering in his attempt to reach the country north of lake Rudolf, from Somaliland. As regards North America, exploration through the interior of the Labrador Peninsula has been conducted by Mr. A. P. Low, and an expedition has been successfully led through the barren lands of Northern Canada by Mr. J. Burr Tyrrell, of both of which undertakings full accounts have been or will be published in our *Journal*. Sir William Macgregor, who has already done such excellent geographical work in New Guinea during a long course of years, has again returned to his government, with a supply of instruments provided by the Society, and with the intention of increasing our obligations to him, as geographers. But he already deserves the highest honour this Society can confer upon him. The chief literary event of the year is Dr. John Murray's completion of the great work on the results of the *Challenger* Expedition, to which I propose to refer more fully in another part of my address; and next in importance is the work on the Morphology of the Earth's Surface by Dr. Penck. We have had a popular work from Dr. Robert Brown, giving us the story of Africa and its explorers in full detail; Sir W. Martin Conway's account of his successful and very interesting Karakorum expedition, Mr. Curzon's Problems of the Far East, and three important works on Tibet by our gold medallists, Mr. Rockhill and Captain Bower, and by Dr. Waddell. I may also mention the new edition of Mr. Keltie's very useful work on the Partition of Africa. Our grants in aid of geographical and archæological exploring in Asia Minor, have been fully justified by the results of the work executed by Mr. Hogarth's expedition in the upper valley of the Euphrates, and by that of Mr. Paton and Mr. Myres in Caria.

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* Delivered at the Anniversary Meeting, May 27, 1895.

The intention I announced, in my address last year, of attaching a list of Fellows who have written for our publications, or have published books on subjects connected with our science, or have been distinguished as explorers, to the general List of Fellows, has now been carried out. It is arranged in two parts, the first alphabetical, and the second according to countries and subjects. I trust that it will be found useful, and that, by informing the great body of the Fellows respecting the qualifications of such of their associates as possess special knowledge, it will have a tendency to give rise to more intimate relations among themselves and with the Council. I shall be glad to receive any suggestions respecting this list from the Fellows, and any proposed additions to it.

A decision was arrived at with reference to our premises last summer, it being resolved that the accommodation in our present house should be improved and enlarged, and that it should be fitted throughout with the electric light. The work was commenced in July, 1894; and several hundred Fellows, at my reception last December, were enabled to inspect the alterations from roof to cellar in, I trust, an agreeable way, and to judge of the increased comfort that had been provided for students, and of the improved arrangements for our large collection of maps, books, photographs, and instruments. The alterations have made it possible to re-arrange the shelves of the library and to re-classify the volumes, which has involved very heavy work. Great progress has also been made in the press-marking, and a geographical arrangement of the library has been adopted, while the immense stock of bound volumes of transactions of Societies have been put into thoroughly good order by Dr. Murie. The upper library is supplied with tables for Fellows who are engaged in geographical investigations. The increased attractions of our rooms have produced the anticipated result of increasing the number of Fellows who use the library, and the borrowing of books has also increased. The alphabetical author's catalogue, as I promised at the last anniversary, is now finished, with its three appendices, and will be in the hands of Fellows as soon as the volumes are bound. Dr. Murie deserves great credit for his share of this work, especially for his classification of the periodicals, and important assistance has been rendered by Mr. Heawood in preparing the second appendix. Two of the Members of our Council have been so good as to read over the whole of the proofs of the alphabetical part of the catalogue, making numerous corrections, and Dr. Mill has personally verified all the cross-references, and has superintended the whole work with untiring zeal and ability. The alphabetical part of the catalogue contains 15,000 titles and 5000 cross-references, and the appendices have nearly an equal number of entries.

Work on the subject-catalogue will now be carried on without intermission. A large part of it is done; and, in order to make it available with as little delay as possible, I am inclined to advise that the divisions shall be completed one by one, instead of proceeding on all departments simultaneously, and that they shall be brought out as they are completed.

The compilation of the catalogues has revealed many serious gaps in the library, and I have supplied some lists of works which ought to be added. These are classified in a new desiderata book, and the works will be secured as opportunities offer. Our library is excellent, and, as regards early geographical work, I believe that it is even approaching completion. But we must strive to make it perfect; and I would invite the Fellows to assist us in filling up the desiderata book with the names of geographical works which we do not now possess. It would also be desirable if every Fellow would supply a separate copy of any papers on geographical subjects which he may have written, but which are not in the library.

The afternoon meetings in the Society's map room were commenced this session. It appeared to me that the more special and scientific sides of our work were not receiving sufficient attention, and those who are interested in them have not been afforded proper opportunities for bringing forward or discussing important points unless they were rendered popular, and adapted for a mixed audience. There are many questions of interest relating to geographical science which cannot be so treated, and which require an audience more or less of experts for their due hearing and discussion. This want has now been provided for, and the more strictly scientific phases of geography are no longer ignored. The communications which I anticipated for reading at the afternoon meetings relate to special points in comparative geography, to cartography in all its branches, to orthography, to the invention and improvement of instruments and other appliances, to special points in oceanography, to questions in physics bearing on geography, and to kindred subjects. I thought that all these might most usefully be received and discussed by select audiences of experts among our Fellows.

We have had four of these afternoon meetings during the present session. At the first a paper was read by Mr. Yule Oldham, on his theory of an early discovery of America, deduced from a marginal note on the 1447 map of Andrea Bianco. It was followed by a very full discussion, for which there certainly would not have been time at one of our ordinary evening meetings. In January we were favoured with a most valuable lecture from Professor Rücker on terrestrial magnetism, which was followed by a discussion, in which several scientific men of great eminence took part. We had a third very interesting afternoon meeting on February 22. On this occasion my talented young friend Lieut. Carlyon Bellairs, R.N., explained to us his graphic method of showing the duration of daylight, which is equally useful to the traveller and for operations of war. Mr. W. B. Blaikie showed us his new cosmosphere, and Mr. R. A. Gregory exhibited his instrument for demonstrating the apparent diurnal motions of celestial bodies. In March Dr. J. W. Gregory, the accomplished geologist and well-known African traveller, discussed the palæontological evidence as to the age of the Atlantic. His address was followed by a very instructive discussion, in which both geographical and geological considerations were brought to bear on the question.

The want of some such provision for the consideration and discussion of scientific and technical points had long been felt. It will be remembered that, during three sessions—from 1876 to 1879—three scientific lectures were delivered in each session, but, after 1879, they were discontinued, and nothing was done to supply their place. The arrangement by which the communication of scientific and technical papers is invited, and their consideration and discussion provided for at afternoon meetings, will, I hope, fully meet the want which has so long been felt in the Society. I believe that our afternoon meetings will be the means of drawing to us the sympathy of scientific men, and that they will lead to the discussion of important and interesting technical questions in various departments of our science which have not hitherto received due attention.

The meeting of the International Geographical Congress in July warns us to look to our own position as geographers, and to consider whether we are quite abreast of our foreign friends in the various departments of our science. In geographical education we must sorrowfully confess that we are still far behind, in spite of all the efforts and all the expenditure of this Society during a long term of years. But the time is approaching for a reconsideration of the educational policy of the Society, and I trust that we shall pass from the experimental stage to the development of a defined and carefully considered system producing valuable results to our countrymen.

My own fixed opinion has always been that our Society is the only institution in this country which has the means or the will to establish the teaching of geography on such a footing as will place it in line with the position it now holds in other countries. I have urged this view for upwards of a quarter of a century. I have advised that instruction should be given by us, and that diplomas should be granted to young geographers. After more than ten years I prevailed upon the Council to sanction the system of instruction by Mr. Coles, which has now been at work for seventeen years, and which is the most successful and useful educational measure that has yet been adopted by us. But I always intended that this system should be enlarged and extended until geographical education, under the control of this Society, was on an equality with the position it holds abroad. Other educational experiments, adopted by the Council, have interrupted the further development of the preliminary step inaugurated in 1879; but I am in hopes that the time has now arrived for the consideration of a scheme of geographical education under the immediate auspices of the Society. Such a scheme should embrace personal instruction in all the branches of our science, attendance at lectures, examinations, and the granting of certificates and diplomas. We alone have the needful apparatus for conducting such a course of instruction; we alone have the library, and the collection of maps and instruments, and the knowledge of what is required, and in no way can our splendid collections be put to better use. Mr. J. Scott Keltie, in 1884, made a survey of the higher geographical education in other countries, and submitted a very able and comprehensive report. I think the time has come for making another survey on the same lines, to include Russia and the United States; and with full information before our Council, a comprehensive scheme for higher geographical education, under the auspices and the control of the Society, would be matured. There are reasons to hope that our own efforts will, before long, be made to fit in with other educational movements which are taking a similar direction, and which will co-operate to secure the same end. At this moment various causes are at work which, I hope and believe, will combine to produce the establishment of a system of geographical education on correct principles, in close co-operation with the Royal Geographical Society, and which will have a most beneficial effect on all classes of our countrymen. If my anticipations are fulfilled, this country will, in the near future, no longer lag behind, but will take her proper position in line with our friends abroad, as regards the educational department of our work.

At Oxford there is the testimony of several high University authorities that the geographical readership has been very useful to students for modern history honours. We may, therefore, confidently expect that the two great Universities will, after the termination of the present arrangement with the Society, make adequate provision out of their own funds for these geographical readerships. Mr. Mackinder at Oxford has done admirable work, and there can be no doubt that his lectures have been useful in many ways. Mr. Yule Oldham, at Cambridge, during a shorter time, has laboured zealously and with some success in the cause of geography; and Mr. Herbertson, the Lecturer at Manchester, to whose salary the Society also contributes, is, I understand, doing very good work. During the present year he has, in addition to his systematic lectures at Owens College, given a course of geographical lectures at Edinburgh. The prizes given to the Training Colleges and for the Oxford and Cambridge Local Examinations have been very successful measures, and the results of the Society's prizes to the *Worcester* and *Conway* have also been highly satisfactory. Mr. Mackinder's lectures on the history of geography and geographical discovery at Gresham College during the present year were well attended. I acted as examiner on the first series of lectures, and found that the candidates had acquired a fair knowledge of the subject which had been chosen for their special study. Dr. Mill, our librarian, has also given courses of lectures on geography at Brighton, Southampton, and Ramsgate, and special lectures to the Geographical Societies at Edinburgh and Liverpool during the year.

It is a hopeful indication of the interest that has been aroused in the teaching of geography, that some of the assistant masters in public schools, headed by Mr. Dickinson, of Rugby, have formed an Association with the object of improving geographical education in schools. The efforts of the Association are directed to supplying adequate means of illustrating lessons by maps and photographs, to assisting teachers to acquire facility in using such illustrations, and to induce examining bodies to set papers which would be more in accordance with modern views of geographical teaching than those now usually prepared. These laudable efforts deserve recognition and encouragement, and may lead to valuable results with regard to the civil service and army examinations, and to the local examinations of the universities. If the standard of examinations was fixed, after consultation with experienced geographical instructors who are familiar with the Continental and American, as well as with British methods, improvements in teaching would necessarily follow.

The subject of geographical education will occupy the attention of the International Congress, and we may look forward to deriving much information from the experienced and learned men who will address us on this branch of our subject; and to receiving a stimulus calculated to bear good fruit in the adoption of measures to bring us in line with those countries which are, at the present moment, far in advance of us.

I am also reminded by the heavy losses we have sustained this year in the deaths of Sir Henry Rawlinson and Sir Edward Bunbury, and in 1890 in the death of Sir Henry Yule, that in the departments of historical and comparative geography we cannot claim to be quite in line with some of the countries whose representatives are about to visit us. The same attention has not been generally given to this very important branch of our work, as we find to be the case among our continental neighbours, and this in spite of the examples set by those whose recent loss we lament. The places of none of the three have been filled, nor can they at present be adequately filled by any living geographer in this country. I am anxious, therefore, to submit to my associates some reflections on the treatment of comparative geography by the leaders of our science, and on its uses; in the hope that, in this respect, we may endeavour in the future to keep to the front, and, inspired by the work of those geographical worthies who are no longer with us, that explorers and students may give closer attention to the former history of the subjects they may select for investigation, and to the elucidation of the narratives and researches of our predecessors.

D'Anville was the father of critical and scientific geography, but he was only a student; while the founder of geographical science in this country, Major James Rennell, had had a training of many years in the field before he devoted the later half of his life to the study of the work of those who had gone before him, and to the critical elucidation of the labours of his contemporaries. Rennell is the greatest geographer that this country has produced, and the model from which future aspirants to geographical fame should derive their methods and their systems of study and of work. We can examine Rennell's principles of investigation in the account he gives of any of his great works, perhaps most fully in the memoir accompanying his map of Hindostan. Before commencing its construction he collected all the information that was accessible to him, and discussed all the details with great care, bringing the acumen of a thoroughly logical mind to bear on the decision of each doubtful point, giving reasons for all his conclusions, and describing his authorities. He traced back the political divisions of the country, and their history to the time of Akbar, obtaining translations of the Ayin Akbari, and other works throwing light on the subjects of his inquiry. Thus, to establish the position of an important point on the Ganges, which was erroneously placed by D'Anville, it was necessary for Rennell to examine the works of Pliny and of Strabo, to discuss their measurements, and to compare the evidence thus furnished with the most recent information. In his great work on Herodotus, Rennell applied the same principles with equal success. His system may be summarized as one requiring alike an intimate knowledge of ancient writers, and of the work of modern explorers and critics; in which geography makes history intelligible, while history, in return, throws light on many important points in physical geography.

This is demonstrated, in a very striking way, in Rennell's volume dealing with the Africa of Herodotus. In his treatise on the delta of the Nile, and on the changes that have taken place in it, within historical times, Rennell had occasion to examine and discuss the statements of the ancients and their evidence respecting the changes in the channels, while his own extensive knowledge of the Gangetic delta enabled him to explain the causes of those changes. His remarks on deltas and estuaries, on the positions of river bars, and on their formation, and his application of these physical principles to the history of the Nile delta remind us that a geographer must be as well acquainted with the history of the region he wishes to explore, as with physical science. Rennell's treatment of the questions involved in the story of the circumnavigation of Africa by Phœnicians, as told by Herodotus, and in the Periplus of Hanno is so thorough that he may be said to have finally settled them. As regards the circumnavigation he made careful calculations of rates of sailing as given by Nearchus and other ancient writers, considered the effects of winds and currents, and based his conclusions on a critical examination of the evidence. Speaking of the Periplus of Hanno, Sir Edward Bunbury considers the arguments of Rennell, which have been adopted by later editors, to be conclusive, and says that "the merit of having established the true view of the question undoubtedly rests with the great English hydrographer." His examination of this problem is indeed a masterpiece of critical reasoning; and the same may be said of his paper on the topography of Babylon, in which he compared all the statements of ancient and modern writers with extraordinary acuteness and sagacity. Here again his conclusions have the concurrence of the latest authorities, such as Canon Rawlinson.

Exactly the same training, as regards historical geography, is required for an explorer as for a cartographer or a student. A very striking instance of the necessity for a traveller to study all that has previously been written on the region he has explored, is afforded by Mr. Curzon's important monograph on the Oxus. Our Vice-President had searched every authority from Istakhri and Edrisi to the latest modern visitor of the Pamirs, for any notice of the precise source of the Oxus. Several writers referred him to the more southerly or Panja branch as the originating stream, but none to the actual source, until he found such a notice in a memoir by Lieutenant Macartney, forming an appendix to Mountstuart Elphinstone's "Kingdom of Caubul." A native informant supplied Macartney with a correct description of the Wakh-jir source of the Oxus; and equally correct information is contained in the report of Pundit Manphul, printed in 1862 as an appendix to Davies' Trade Reports of the North-West Frontier. Both these sources of information had been overlooked by previous writers on the Oxus; but it is the special merit of Mr. Curzon that he never contents himself with mere exploration. He studies the history of the regions he visits with great care, traces out the records of their cartography and the origin of errors in the maps, and makes an exhaustive and critical examination of all that has previously been written on the subject.

This is an example which ought to be followed by all explorers, for knowledge of the previous history of a region, and of all that has been written on its geography, is quite as essential a qualification as the ability to map a country and to fix positions. Otherwise the explorer is merely an instrument of research, directed by others, and supplying material for others to elaborate and discuss.

We find another pattern for writers of geographical memoirs in the memorable communications of the late Sir Henry Rawlinson, on his journey through Persian Kurdistan to the ruins of Takht-i-Suliman, and on the site of the Atropatenian Ecbatana. There may be only one Ecbatana site at Hamadan, or the illustrious geographer's theory may be correct as to the existence of another in Media Atropatene. My object in referring to these memoirs is not to uphold either contention, but to point out that no one but a geographer, trained to lay down his routes with accuracy, and with an eye to take in and comprehend the physical aspects of the country he traverses, was capable of discussing the question as Sir Henry discussed it. He was only twenty-eight years of age at the time, and I mention this to show that the combination of learning with energetic exploration need not be an attribute of advanced years. Every young explorer may be a Rawlinson, as soon as he is convinced that diligent acquisition of knowledge is as necessary for distinguished success as high courage and contempt of danger and of hardships. For, although young in years, Rawlinson was a ripe scholar when he left the camp at Tabriz in October, 1838, and set out on his adventurous journey. When he had completed his examination of the ruins at Takht-i-Suliman, drawn careful plans, mastered the physical aspects of the surrounding country, and considered all the routes leading across it, he proceeded to the identification of the site by the light of his profound knowledge of eastern history, and by a comparison of Persian manuscripts with Byzantine chronicles. But it must be remembered that this was done while still in Persia, not after returning to England, and coming within reach of great libraries. His critical method was a sure and safe one. He first verified the ruins of Takht-i-Suliman in oriental geography, then identified the name given by the early Arabs with one found in Byzantine writings, next he traced up the fortunes of the place through the flourishing periods of the Roman Empire, and finally came to the dark period of the Median dynasty, when the name of Ecbatana first appears. He thus set out from a fixed base of direct and well-established proof, and built up a superstructure upon a sure foundation. As his argument gradually ascended along the chain of evidence into fields of more remote inquiry, criticism could, at any point, withhold assent to his opinions, without endangering the stability of any part of the preceding argument. So that later critics might reject the theory of a northern Ecbatana, apart from that at Hamadan; but such dissent in no way impugned the principal part of Rawlinson's argument by which he proved the origin of the name of Takht-i-Suliman, its identity with the Shiz of Persian and Arab writers, and the identity of Shiz with the Byzantine Canzaca. I have explained the method adopted by our late President, in applying his geographical researches and his historical learning to the elucidation of one of the great problems in Asiatic comparative geography, because it is identical with the method of D'Anville, and with the method of Rennell. But his memoirs convey to us a more important lesson. They prove to us that there is nothing to prevent a young explorer from making himself thoroughly acquainted with the previous history of any region he may select for the subject of his researches, before he commences his actual work in the field. If he only acquires such knowledge after his return, it will be a continual source of regret to him that he did not possess it when he was on the spot, when it would have guided him to fresh investigations of ever increasing interest. On this point I speak from my own experience; whereas, if he goes out fully armed with the results of study and research, he will find himself to be provided with advantages of inestimable value when he reaches the scene of his operations.

Such advantages are now easy of attainment when there is a strong wish to possess them, and the desire to do well, "Talant de bien faire," the motto of Prince Henry the Navigator. But this was not always the case. In former times there were often greater difficulties to overcome than there are now, and probably the very necessity for overcoming obstacles, and the persevering resolution which was thus engendered, was one cause of success. It is, therefore, very desirable that young geographers should study the life-work of their predecessors, and the methods through which they rose to eminence. The stories of the lives of great men who have devoted their best years to geographical work in the field or in the study are most instructive as well as interesting. While inciting the student to emulation, they teach him lessons of inestimable value, and guide him to the best methods in the conduct of his own researches. He may take for himself a pattern from among his predecessors, or still better he may select the best points from several examples among the *Dii Majores* of our science, and so form for himself an ideal to strive for, and if possible to attain.

In the case of James Rennell he will find a successful conquest of many difficulties, through perseverance, good conduct, and great ability. Beginning life as a midshipman in the navy with no interest, Rennell found himself without any hope of preferment at the close of the Seven Years' War; but he had made the best of his time, and had worked diligently during his six years at sea, losing no opportunity in practising marine surveying and the construction of charts. He left the navy at Madras, volunteering for the service of the East India Company, and very soon afterwards he received a commission in the Bengal Engineers, and was appointed Surveyor-General. During the fourteen following years he completed the famous survey, and at the end of them he brought out the atlas of Bengal. In those seasons of each year when he was not employed in the field, he was an assiduous reader, and he acquired those habits of study combined with critical insight and power of assimilation, which secured for him, during many subsequent years, the most prominent position among the geographers of Europe. The greatest comparative and critical geographer that this country has produced, Major Rennell is an example of the success which attends the combination of knowledge derived from the study of books, with active work in the field. From this point of view, a contemplation of this illustrious man's biography, of his methods of research, and of the history of his literary labours, cannot fail to suggest ideas and habits which will be valuable for the guidance of those who aspire to follow in his footsteps.

Rawlinson had some advantages at the opening of his career, which were denied to Rennell; yet his success was equally due to his own merits. Selected, early in life, as one of the officers who were designated to organize the troops of the Shah of Persia, he devoted every spare moment to the study of the history of the region whither his duty had taken him, perfecting himself in the language, collecting manuscripts, and mastering the works of Greek authors, as well as the more modern publications on the subject of his labours, as a necessary preparation, and as an indispensable qualification for geographical exploration. This is the explanation of the remarkable fact that so young an officer was able to send home papers to this Society which, as Mr. Vaux has truly remarked, have thrown more light on the geography of the part of Asia he described, than any other work, ancient or modern. If Rennell is a model whose methods should be examined and imitated by all classes of geographers, our late President, Sir Henry Rawlinson, is assuredly the man whose example should be studied and followed, more especially by military men who become devotees of our science.

Our naval associates have many well-known names to refer to among those of their profession who have given special attention to geography, and have become leading members of this Society. Smyth, Colchester, and Beechey, who were our Presidents, Beaufort, Basil Hall, Fitz-Roy, and Franklin, Collinson, Washington, and Back are household words amongst us. The work of all is of permanent value, and that of the majority has been worthily recorded. But, from the point of view of the particular department of our science which I am now discussing, I should be inclined to mention the career of the late Admiral

Sherard Osborn as one which might usefully be recommended as an example, and as worthy of attention by naval geographers. Always devoted to geography, Osborn was in the habit of studying the history of discovery as it bore on the countries he visited from his earliest youth. Whether on the shores of the Malacca peninsula, or in the Pacific Ocean, or in the Arctic Regions, or in the sea of Azof, or up the Yang-tsze-kiang, Osborn, during his active service, never neglected his literary researches, and never forgot his journal. I may mention that while in the Pacific, as a very young officer, he made a special study of the river system of the Amazons, and of its capabilities as a route for commerce, tracing out the history of the principal voyages and of the discovery of its numerous tributaries; and that these studies bore fruit, in after years, when Osborn became a director of the Amazon Steam Navigation Company. The manuscript of his memoir on the Amazonian basin is now in my possession. His services in the Arctic Regions are matter of history, but the extent of his historical researches in connection with polar discovery is not so well known. Those researches were not confined to narratives of voyages, but included all that had been written on the Eskimo and Siberian tribes and their movements. The charm of his writings is derived from gifts which few possess, but their permanent value is due, in no small degree, to the thoroughness of his researches. Many still remain amongst us who remember Sherard Osborn's important papers read before this Society, and recall his bright and cheery face, his hearty greetings, and genial voice. He was one of the very best naval writers of his generation, and, in the publication of his narrative of Sir Robert M'Clure's voyage, his hope was that it might remain as the history of a great event in naval annals, and perhaps awaken in the breasts of future Franklins and Parrys that love of perilous adventure which must ever form the most valuable trait in the character of a maritime people. It was mainly to Osborn that the renewal of polar research in 1875 was due, and we hope that the memory of his arguments and of his heart-stirring appeals will not be without its influence in promoting the despatch of an Antarctic voyage in the near future.

But it is to Sherard Osborn's commendable habit of keeping a careful journal that I am anxious to call the attention of young officers who aspire to do useful work as geographers, for I know that many of them have that ambition, both in the navy and in the merchant service. The prizes given by our Council to the cadets of the *Worcester* and *Conway* are not given in vain. On the contrary, it is within my knowledge that they are having an effect which is most gratifying. By all such aspirants Sherard Osborn's advice, given in the preamble of his charming book entitled 'Quedah,' should be taken to heart. "The majority of naval officers are self-taught men," he says, "the world their book—the gunroom their *Alma Mater*. To these he would say that to a steady habit of keeping a journal, noting down all he saw, read, or felt, and, in spite of all its shortcomings, still educating himself with his journal, he is mainly indebted for being able to fight his way up an arduous and emulative profession."

Hitherto I have dwelt on the services that geography has done to history, from the days of Herodotus and Thucydides to the days of Freeman. Explorers have shown the influence that the surface of the land, in its varied aspects, has had on the settlement and movements of the human race, and on the operations of war. Travellers have fixed the sites of cities and of battlefields, and have thus unravelled many a perplexing historical knot. Comparative geographers have explained obscure passages and solved historical questions which could not have been made clear without their aid. History has always looked to the science of geography for the way out of many difficulties, and for the solution of a large class of her problems, and she has never looked in vain. The search lights of geography have penetrated into many of the obscure periods of the story of our race, and shown ways which, without their help, would have continued to be wrapped in obscurity.

On the other hand, geography is equally indebted to the labours of the historian. I do not here allude to the changes on the earth's surface of the greatest importance and the deepest interest, of which we should know nothing if they had not been recorded in history. This part of the subject is so extensive that it would require much space, and might well occupy us during the whole time allowed for an anniversary address. Moreover, I have already treated of this phase of the subject to some extent in my paper at the Nottingham meeting of the British Association. But I would dwell upon the charm that historical reminiscences give to geographical work, whether it be the work of explorers or surveyors, or the mature labours of scientific students. It is also necessary, on many occasions, to elucidate a scientific geographical treatise, or the results of researches, by furnishing a thorough historical introduction.

Such an introduction was required for the report of the scientific results of the voyage of the *Challenger*, bound up in fifty large quarto volumes—a monumental record of continuous and diligent work, which may almost be said to have created that part of the science of oceanography treating of ocean depths, and, as Dr. Murray truly says, which marks the greatest advance in the knowledge of our planet since the celebrated discoveries of the fifteenth and sixteenth centuries.

As an introduction to such a work, it is necessary to trace the gradual development of our knowledge concerning the ocean from the dawn of history to the time of the *Challenger* expedition, and this has been done by Dr. Murray with a master hand. Dr. Murray's historical introduction is an excellent example of the necessity for a knowledge of past events, which the geographer feels in the adequate treatment of every department of his science. In the study of oceanography he must be acquainted with the conceptions of the Phœnicians and the Greeks, and with the earliest authentic voyages. Dr. Murray explains the views of Aristotle concerning the phenomena of the sea, and the distribution of land and water, and points out that the Stagyrite's researches on marine animals were of distinct scientific value. A knowledge of the systems of Eratosthenes and Hipparchus and the other ancient geographers, and especially of the views held by Strabo respecting the sculpturings of continents and the level of the ocean, is also necessary for a student of oceanography; and these are ably described by Dr. Murray, as well as Pliny's ideas respecting marine organisms, and the whole system of Ptolemy; nor does Dr. Murray consider the speculations of the Arabs and the ideas of the schoolmen of the Middle Ages to be foreign to his subject; while a knowledge of the discoveries of Columbus and Vasco da Gama, of Magellan and Cabota, is clearly a part of the qualification for a student of oceanography. Magellan, indeed, was the first recorded navigator who attempted to make a deep-sea sounding. The nomenclature of the oceans, the adoption of hydrographic signs, and the introduction of isobathic lines on marine charts, are all points for an acquaintance with which the oceanographer is indebted to researches into the history of cartography, as well as for details as to the progress of knowledge respecting tides and currents. Lastly, the history of the views held by navigators and scientific men on the physical and biological conditions of the sea, and on the causes of oceanic phenomena, during the last century, must be familiar to the oceanographic student before he is duly provided with the necessary qualifications for his task. All these points are fully treated by Dr. Murray in the historical introduction which forms the opening chapter to the two final volumes of the great *Challenger* work, containing the summary of results. It is a treatise of the greatest interest, showing evidence of much careful research; and this is the first time that a history of the progress of knowledge respecting the phenomena of the ocean, from the earliest times, has been prepared by a fully qualified hand.

Dr. Murray's historical introduction, I repeat, is an excellent example of the uses of history in the study of the various departments of geographical science. Without a knowledge of all that has been done before his days, of the hypotheses that have been started and the discoveries that have been made, the student would waste much time, and would not be half armed for the service upon which he may be engaged. It cannot be too strongly urged upon the attention of the scientific student, as well as upon that of the surveyor and the traveller, that an exhaustive knowledge of the history of the work to which he is devoting his time and attention is an indispensable introduction to all progress. This, of course, is felt at once by many of those who enter upon the study of geographical questions, or on the exploration of little-known regions;

but the feeling is far from being universal, and I cannot think that it is out of place to insist upon the great importance of the acquisition of a thorough knowledge of the history of every geographical subject to be investigated, and of every region to be explored, as a preliminary to the commencement of work.

There is another way in which history confers a great boon upon the traveller, and that is by adding a charm to his wanderings, and by intensifying the pleasure he takes in every detail of the route he is engaged in exploring. From this point of view the relative importance of the passes leading across the Himalayas into India is made clear by a knowledge of the routes used by the successive conquerors, and of the circumstances under which their invasions were undertaken. With historical knowledge the wildest deserts and the barest and most dreary wildernesses receive a charm from the reminiscences which surround them. How monotonous would have been the work of Lieut. Kempthorne in the Persian Gulf, if his labours had not been enlivened and lightened by his attempts to identify the points of land and the fishing hamlets with the places mentioned in the voyage of Nearchus! How immeasurably is the interest of a journey from the plains of Mesopotamia to the Black Sea heightened by the work, so graphically described to us the other night by Mr. York, of tracing the Roman road and identifying the legionary stations! There is scarcely any part of the known world where a knowledge of history will not increase the interest of a journey and afford enjoyment to a lover of wild or beautiful scenery, as well as to the explorer of even the most monotonous coast line.

I may refer to my own experience in travelling over the Abyssinian highlands with the late Lord Napier's field force. As soon as we came on the track of the Portuguese Embassy of Rodriguez da Lima in 1520, which is quaintly described by Father Alvarez, the interest of the route was very materially increased. There was a ruin at a place called Agula. Without an acquaintance with the volume of Alvarez it would have been a ruin and nothing more. But when, after comparison of the routes and descriptions of the country, it appeared to be his "church of Quiricos at Angagui," * the whole interest, not only of the ruin but of the surrounding district, was greatly increased. I remember that it was while engaged on a plan of this ruin, now many years ago, that I first made the acquaintance of Mr. Henry M. Stanley.† "The place is very faire upon a very goodly river," says the translator of old Alvarez. Again at Meshik and at the Alaji Pass we came upon scenes well described in the narrative of the old monk; and the interest of the route was thus enhanced by historical reminiscences until we approached Lalibela, his city of churches. It will at once be seen how the dullest country, as well as the most beautiful scenery, is rendered doubly

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* Alvarez (*Hakluyt Society*), p. 97.

† On February 15, 1868.

interesting when the imagination is able to clothe it with recollections of former travellers who have traversed the same route, or of memorable deeds performed on sites which the traveller's knowledge and discernment enable him to identify.

In the same way, the naval officers who are engaged in the severe and sometimes rather monotonous work of marine surveying, often not only have their interest in history aroused by the reminiscences connected with the coasts on which they are employed, but even acquire literary and scientific tastes which endure through life, as in the cases of Sir Francis Beaufort on the coast of Caria, and of Admiral Spratt in Candia; while our founder, Admiral Smyth, became a first-rate numismatist owing to the collections he had the opportunity of making on the coasts of Sicily and Africa. In the Straits of Magellan, too, the identification of capes, bays, and peaks mentioned by old Sarmiento, was a source of never failing interest to Captains King and Fitz-Roy, and their officers. Don Pedro Sarmiento was the best type of a Spanish sailor of the sixteenth century. After Sir Francis Drake traversed the strait and broke into the South Sea on board the *Golden Hind*, the Viceroy of Peru sent an expedition under Pedro Sarmiento to explore this passage from the Atlantic and to report upon the feasibility of fortifying it, so as to prevent any further piratical depredations. The veteran sailor thoroughly explored all the intricate channels leading from the Gulf of Trinidad in three boat voyages, and then made a running survey of the Strait of Magellan. He was the first navigator who gave a detailed and intelligent description of the strait. The English surveyors, under King and Fitz-Roy, and afterwards those under Sir George Nares, were delighted with this ancient mariner's work, and found, in the identification of his names, a source of interest and pleasure which lightened their arduous and trying service. Thus the *Alert* was kept swinging to and fro, and circling round her anchors, by the heavy squalls from various quarters, in the very place which Sarmiento had named—"a box on the ear from the Devil." The snowy mountains he described were named the "Cordillera of Sarmiento" by the English officers. "The ancient Spanish mariner's 'Hill of the New Year,'" continues the narrative, "cannot be mistaken, indeed the whole of the coast is so well described by Sarmiento that we have little difficulty in determining the greater number of places he visited. In all cases we have, of course, preserved his names." Indeed, his names have been retained, wherever they could be identified, throughout the strait. "Any name," says Fitz-Roy, "which was given by this excellent old navigator is too classical and valuable to be omitted;" and it was with real pleasure that Fitz-Roy christened the lofty snowy peak seen from Port Famine, which was well described by his Spanish predecessor, with the name of Mount Sarmiento.

This is one more instance, out of a great number, showing the interest which is always to be found in the former history of any locality that has to be explored or surveyed. There can be no doubt that an acquaintance with the surveying work executed by Pedro Sarmiento in 1580, very much increased the interest of the arduous service on which Captain Fitz-Roy and his officers were employed, and it undoubtedly enhances the pleasure of the reader in perusing the narrative of their survey.

I have endeavoured, in thus illustrating the points I am anxious to establish by actual examples, to bring them more forcibly before my associates, and, by convincing their understandings and engaging their imaginations, to secure such attention for them as will eventually bear fruit. They may now be briefly summarized. The geographer, whether he be a student or an explorer, who acquires a thorough knowledge of the previous history of his subject, more than doubles the pleasure to be derived from his labours, while it enables him to make them infinitely more useful. His best preparation for these studies, as well as for subsequent work, is an acquaintance with the methods of those leaders of our science who have gone before him, and with their life stories—of such men, for instance, as Major Rennell, as Sir Henry Rawlinson, and as Admiral Sherard Osborn. This preparation enables the comparative geographer to do most important service to history. In return, he derives from history the knowledge which is essential to the full comprehension of the various branches of his own service, and he also obtains from history the means of immensely increasing the interest and charm of his researches, whether conducted in the study or in the field.

It is by considering the best means of maintaining the high position now held by geography from a similar point of view that we arrive at another conclusion. Retrospects, as has been seen, are necessary for the execution of really valuable geographical work. They are also of service in reminding us of the great deeds and illustrious lives of our predecessors; and thus a conviction of the useful results to be derived from the commemoration of anniversaries is forced upon our minds. Such celebrations are to be commended on several grounds. It is very desirable that from time to time we should set apart these special days for a contemplation of the lives of the most important worthies among our geographical ancestry, for a consideration of their methods and of the ways in which they attained to greatness, and for a contemplation of their achievements. Those who take part in these commemorative celebrations use that opportunity of refreshing their memories by a renewed study of a particular period or phase in the history of our science. Our younger associates have their enthusiasm aroused, and have examples set before them which they are incited to emulate. The ceremonies themselves are both interesting and instructive; and we have found that they have a tendency to connect us with our brother geographers in other countries by closer ties of sympathy and friendship. The celebration of the Columbus centenary, to which we devoted an evening in 1892, was gratifying to our brother geographers in Italy and Spain. That of Prince Henry the Navigator, in which H.R.H. the Duke of York took part, was welcomed in special telegrams from the King of Portugal and from the Lisbon Geographical Society. Our recent commemoration of the anniversary of the departure of Sir John Franklin's expedition brought back to us memories of past heroic achievements, and renewed the generous feelings which were aroused at the time by the cordial sympathy of France and of the United States. For all these reasons it seems well that the Society should, on fitting occasions, take special steps for doing honour to the memories of the *Dii Majores* of geographical science.

In what I have said on the great importance of cultivating the historical side of geography, my hope and expectation has been that some of the arguments I have employed may strike the imaginations and have some influence on the views of the working sections of my associates. A great number, I do not doubt, needed no such reminder to strengthen convictions which they already entertain. But the matter may not have presented itself in the same light to many of us, and as regards these I would fain hope that my words have not been entirely wasted. The presence of many famous comparative geographers at the Congress will also have an effect upon us, and I sincerely trust that before many years we shall find ourselves in line with our colleagues in this, as I believe we already are in most of the other departments of our science.

Since I announced to you the progress of our efforts to create in the public mind a feeling of the importance of despatching an Antarctic Expedition, those efforts have not been relaxed. The Council of the Royal Society referred the question to a Committee last year, and the admirable and convincing Report of that body is dated in May, 1894. The Committee dwelt mainly on the results to be derived from Antarctic research with reference to a magnetic survey, showing that the expedition was a necessity from the point of view of terrestrial magnetism alone. Reasons were also adduced to show that the best time for such an expedition, as regards magnetic observations, would be in the next year or two. Last December the Council of the British Association passed a strong resolution in favour of an expedition, at a meeting when the Marquis of Salisbury was in the chair; and we have since received similar encouragement from all the principal scientific societies in Great Britain, as well as from the Australian Association for the Advancement of Science. The Governments of the Australasian Colonies have also been addressed on the subject, and a reply has been received from New Zealand, of a favourable character. With the object of informing and enlisting public opinion in our favour, I read a paper on the Antarctic Expedition from a colonial point of view at the Imperial Institute on the 4th of March, which was well received; and on April 10th I delivered an address on Antarctic exploration from a naval point of view at the United Service Institution, which was followed by an enthusiastic discussion, leaving no doubt with regard to the feeling of the navy on the subject. The next steps will be to decide upon the *personnel* of an influential deputation in concert with all the other societies, and upon the best time for approaching the Government on the subject. We are backed by the unanimous voice of all our scientific corporations, and I have every reason to believe that we shall be supported by the press and by public opinion. If this be so, we may consider final success to be certain. But be this how it may, I now repeat what I said when Dr. Murray's paper on the renewal of Antarctic exploration was read on November 27, 1893, that I for one will never swerve from the task of obtaining the despatch of an Antarctic expedition while I occupy this chair. At the same time, I believe, with Dr. Murray, that a Prime Minister "will be found sufficiently alive to the spirit of the times, to carry through an undertaking worthy of the maritime position and the scientific reputation of this great empire." Captain Larsen's Antarctic discoveries to the south of the South Shetland Islands, and the more recent voyage of the *Antarctic* to Victoria Land, have had the effect of keeping up an interest in the subject.

In the far north our interest is fixed on the proceedings of the expedition to Franz Joseph Land, so munificently equipped by Mr. Alfred Harmsworth, and commanded by Mr. Frederick G. Jackson. Its plan is for nine explorers to land on the shores of Franz Joseph Land with houses both of heavy logs mortised together, and of canvas and light planks, for their depôts and observatory. From these headquarters the exploration and discovery to the northward is to be conducted by dog-sledges and two aluminium boats, depôts of provisions being established at proper intervals. Mr. Harmsworth has equipped the expedition with a judicious liberality which is worthy of the very best days of our merchant princes; and the care with which Mr. Montefiore has attended to all the details of supply, many of them requiring much thought and investigation, is above all praise.

I went on board the *Windward* at Greenhithe, on July 12, 1894, to see the last of the gallant adventurers, and we gave them three hearty cheers on leaving the ship. The eight Englishmen to whom, as well as to their leader, is entrusted, for the time, their country's Arctic fame, were standing right aft as the *Windward* gathered way, together with Mr. Montefiore, grouped round their commander, Mr. Frederick Jackson. There stood young Armitage, the astronomical observer, formerly a *Worcester* cadet, and arousing the enthusiasm of his young successors by the splendid example he was setting before them; for the *Windward* had come-to within a few hundred yards of the old *Worcester*.* There were Reginald Kettlitz, the medical officer and geologist; Harry Fisher, the botanist; Dursford, the surveyor; F. J. Child, the mineralogist and photographer; Sidney Burgess, and John Heywood, the youngest of the party. We shall hear all these names again, I trust, in connection with many gallant exploits. We certainly heard their possessors on that July afternoon, as their returning cheers resounded on the water.

The *Windward* arrived at Archangel on July 31, where winter clothing and log houses in pieces were embarked, as well as four little ponies. Sailing on August 5, thirty dogs were taken on board at Khaborova, and the expedition then proceeded on her adventurous voyage. She was last seen in the end of August by the *Betsy* walrus sloop, in 70° 45′ N. and 44° E., steaming up an open lead in the ice. I trust she safely reached her harbour on the coast of Franz Joseph Land. The *Windward* has not returned after landing the explorers, as was intended, but this contingency was foreseen, and eighteen months' provisions were supplied for her crew of twenty-three men. The explorers themselves are provisioned for four years. It is not Mr. Harmsworth's intention to send out a vessel to communicate with them in the present year; but in 1896 a ship will, in any case, be despatched with stores and provisions, and two or three good men to replace any who may be invalided. There does not, therefore, appear to be cause for special anxiety as yet, and on the return of the *Windward* this summer or autumn, I earnestly hope that we shall receive a prosperous account of work happily begun, and of the good health and well-being of our gallant fellow-countrymen.

Arctic and Antarctic subjects will receive attention at the coming Congress, with many others. Among them there is one to which my attention has been specially called respecting the need for more accurate surveys in Africa, and which I feel bound to notice in my Address.

The time is approaching when rough exploring work will be less required, and when surveys of some accuracy will alone be of value, while generalization and the discussion of accumulated data will become increasingly important. Last March I received a letter from Lieut.-General E. F. Chapman, which places the requirements of the political and commercial geography of Africa in an important light. He reminds me that there are large portions of that continent which have been for years occupied by European settlers, and under civilized administration, of which no accurate maps exist. General Chapman suggests that the occasion of the meeting of the International Congress in London offers an invaluable opportunity for considering how a reasonably accurate and complete map of Africa can be built up, and for urging upon the different Governments and Geographical Societies the advantages of united action. Triangulation surveys have been executed, or are in progress, in Cape Colony, Natal, Bechuanaland, Lower Egypt, and in Algeria and Tunis, as well as in Erythræa. General Chapman urges that, in regions beyond the range of geodetic surveys, travellers should make surveys of areas rather than of routes, and that such surveys should be based on theodolite triangulation wherever it is possible. A complete record should be collected, as regards Africa, of all the positions that have been fixed astronomically in areas that have not been triangulated, and measures should be adopted for the purpose of determining new positions. These suggestions will engage the attention of the International Congress, and there is every reason to hope that they may lead to representations being made to the civilized states of Africa with reference to the importance of carrying out geodetic surveys; and to the execution of surveys in the unsettled parts, on the system proposed by Colonel Trotter at the Cardiff meeting of the British Association.

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* Captain L. Henderson Smith, R.N.R., has requested me to express his regret that he was unable to be present on the departure of his old pupil, Mr. Armitage.

This is, however, only one of the important questions which will be brought forward for discussion at the International Geographical Congress. The programme which has already been prepared embraces all the different departments of our science. Major Darwin, as Chairman of the Organizing Committee, and the two Secretaries, Mr. Keltie and Dr. Mill, have worked hard during the last two years, and have planned out a comprehensive scheme for the work of the Congress; while the labours of Mr. Ravenstein and Mr. Coles, in connection with the geographical exhibition, have been indefatigable, and will secure that the best possible arrangements are made. In his remarks on the International Geographical Congress, held at Venice in 1881, our lamented ex-President, Lord Aberdare, said that "it was hardly possible to bring together men of science and travellers, from all parts of the world, to discuss the questions still unsettled, and those which may be called the questions of the future, without some advantage arising from their meeting." I fully concur in this view of the uses of such an assembly, and I therefore anticipate important results from the great gathering of scientific men, all devoted to the advancement of geography, who will visit our shores two months hence. It will be our agreeable duty to welcome them, to make them feel at home amongst us, and to endeavour to derive all possible benefit from the great stores of knowledge which they will be ready to impart to us; while we vie with each other in our efforts to show them all that we possess which is worthy of their attention, and to make their stay as pleasant and agreeable as possible. We must endeavour to entertain our foreign guests in such a way as that they will regret that the end of their visit has come, and leave our shores with friendly and agreeable impressions of their hosts. I am confident, from long experience, that the Fellows of the Society will combine together heartily and patriotically, and resolve to make the assembly of the International Geographical Congress in London a great and memorable success.

Admiral Wharton, the Hydrographer, has kindly furnished me with a brief summary of a Report on the work of the surveying vessels during the year 1894, which is about to be presented to Parliament.

Re-surveys have been executed on the coasts of Great Britain and Ireland, where both the home surveying vessels, the *Research* and *Triton*, are commanded by Fellows of this Society, one of them an old Arctic officer. On the western side of Newfoundland, a part of the coast from Cape St. George to Long Point has been surveyed, which had not been examined since it was partially explored by Captain Cook in 1765. A systematic examination of the Dacia bank in the Atlantic was made, and some soundings were taken in the Red Sea in search of shallow water reported south-east of the Hanish group. Surveys have been made at Benguela and Walfisch bays on the west coast of Africa. In the Mediterranean the *Stork* was employed in the re-survey of the Maltese Islands. A survey of the port of Argostoli in Cephalonia was also executed.

The *Dart*, still under the command of that indefatigable surveyor, Commander Herbert E. Cust, was at work among the Melanesian Islands, where the surveys of the islands of Ambrym and Pentecost in the New Hebrides group were continued. A violent eruption took place on Ambrym on October 16, causing streams of lava to flow from the central crater, one of which entered the sea, close to the ship, and the surveying operations had to be suspended owing to the dense clouds of smoke and dust. As a possible line of the proposed Pacific cable, a series of deep-sea soundings was obtained between Queensland and the Solomon Islands by the *Penguin*, which was also employed on surveys in the New Georgia Islands in that group.

Some surveys, including the inner route on the Queensland coast, have also been proceeded with in Australia and Tasmania.

As many as 93 new charts have been published by the Hydrographic Office during the year 1894, and 38 have been improved with new plans. The work of the department and the demand for charts appears to have increased very considerably during the last fifteen years, the number of corrections on chart plates from 2040 to 4648, and the number of charts printed from 192,060 to 315,867.

ADMIRALTY SURVEYS DURING THE YEAR 1894.

Under the orders of the Lords Commissioners of the Admiralty, hydrographical surveys have been in progress on the shores of the United Kingdom, the west coast of Newfoundland, Mediterranean, Red Sea, Australia, Tasmania, Solomon and New Hebrides groups, and the west coast of Africa.

These surveys have been carried on by eight steam-vessels of war, and three small hired steam-vessels, manned by 75 officers and 627 men.

Naval surveying officers have also been employed, with the sanction of the Admiralty, under the Indian Government. The results of their labours are also mentioned herein.

A detailed report of the labours performed by each surveying vessel has been prepared, and, in accordance with custom, will shortly be presented to Parliament, of which the following is a brief summary:—

The number of rocks and dangers to navigation, reports of which are being constantly received, show only too clearly the importance of detailed surveys on a large scale, at any rate in those waters which are much frequented by shipping. During the year 1894 no less than 164 of these dangers to navigation were reported to the Hydrographic Department, which required to be notified to the public by Notices to Mariners.

On the shores of the United Kingdom a survey was made of the approaches to Whitby and the entrance to the river Esk. In the Humber, the banks and channels opposite the town of Hull were re-sounded, when considerable alterations were found to have taken place since the previous survey; the Hull middle shoal having encroached greatly on the deep-water space, there is now no berth for a first-class battle-ship off the town of Hull. The Bull sands at the entrance to the Humber were found to have silted up considerably, there being now only 9 feet over them in parts, where heretofore 15 feet was charted.

A large area in the North Sea, opposite the Yorkshire coast, was sounded out in continuation of the work commenced in preceding years; in the estuary of the Thames an examination was made of the Shingles patch in the Duke of Edinburgh Channel, and a re-survey of Sheerness bar and vicinity carried out.

The re-survey of Spithead and approaches which had been commenced the previous year was continued, and completed with the exception of a few small patches. It is satisfactory to find that the changes of depth since the last survey of this important sheet of anchorage water are comparatively trifling.

At Plymouth, the survey of the Hamoaze from Mutton Cove to Saltash bridge was completed, and the river Tamar re-sounded up to Cargreen wharf. Dredgers having been at work in the Sound near the breakwater necessitated the re-sounding of a considerable area on a large scale, and resulted in showing that over various patches the full depth had not been obtained.

In Milford Haven, Pembroke reach was re-sounded on a scale of 28 inches to the mile, and showed that slight changes had taken place since the previous survey. In continuation of the work of the previous year, the survey of the north coast of Anglesea was resumed at Lynus point, and completed as far as the Menai straits, the northern approaches to which were also taken in hand. During the progress of this survey several banks were charted in Dulas bay, and southward of Lynus point, but no danger to navigation was discovered.

A re-survey of Ardrossan harbour and approaches revealed the existence of numerous rocks and shoals hitherto uncharted.

The entrance to Wexford harbour, which had been commenced the previous autumn, has been completed. Considerable alteration has taken place since the survey in 1881, but the depth over the bars remains the same, although the courses of the deepest channels are subject to constant change.

On foreign and colonial shores:—On the west coast of Newfoundland, the survey of St. George's bay was completed, and the coast from Cape St. George northward to Long point, including the whole of Port-au-Port, was thoroughly surveyed. As this region had previously only been partially explored by Captain

Cook in 1765, this survey disclosed material differences along the whole coast included in the season's work in contour, geographical position, and off-lying shoals, several of which were found, but none at a greater distance than half a mile from the land.

In the Mediterranean the re-survey of the Maltese islands was proceeded with. The eastern coast of Malta from Valletta to Hajira Seuda was completed, when several rocks and shoal patches, hitherto uncharted, were discovered. The north-east coast of Gozo from Ras il Kala to Kolla Baydha was also completed in detail.

A survey of Port Argostoli in Cephalonia and its approaches was taken in hand, and by the end of the season the entrance and greater portion of the port had been completed. Meridian distances were also obtained between Malta, Cape Matapan, and Argostoli.

On the passage home to England from China one of the surveying vessels obtained lines of deep-sea soundings between Penang, Colombo, and Aden, and also in the Mediterranean. While in the Red Sea an area to the south-eastward of the Hanish group was sounded, and a cursory examination made of the area in the vicinity of a sounding of 18 fathoms reported as having been obtained by a mail steamer in December, 1892, about 7½ miles to the westward of the dangerous Avocet rock. Though the bottom was found to be very uneven, the least depth obtained was 35 fathoms, and that only once, the general depth around it being 45 to 47 fathoms. This search cannot be considered conclusive, as a shoal head of small dimensions may require most detailed and systematic search before it can be discovered.

On the east coast of Australia a detailed survey was made of Jervis bay, a commodious and land-locked sheet of water much frequented by H.M. ships.

As one of the possible lines for the proposed Pacific cable, a series of deep-sea soundings was obtained between Queensland and the Solomon islands, which included a search for the Ocean Ranger reef, a danger reported to exist by a vessel of that name in 1891. Several days were spent in searching for this danger, but without success. On more than one occasion heavy tide rips were observed with every appearance of shoal water, but on examination it was found that deep water existed in such places.

In the Solomon islands the survey of New Georgia and surrounding islands was continued, and by the end of the year Blackett strait, north coast of Wana-Wana, south coast of Kulambangra, with part of Kula gulf, had been completed, as well as a considerable part of the north coast of New Georgia. During this season, as during the last, no difficulty was experienced with the natives, although their character as inveterate head-hunters is well established.

On the Queensland coast the survey of the inner route was continued, and completed in detail from Cape Grenville as far south as Restoration island, while the triangulation was carried down from thence to Chapman island. During the progress of this survey three pinnacle rocks close together, with deep water between, were discovered about three-quarters of a mile westward of the track recommended, at a part of the route where steamers have been in the habit of steering rather to the westward of the track during the night to avoid the horn of a projecting reef; this discovery is, therefore, of great importance to vessels of deep draught.

In Tasmania a survey was made of Frederick Henry and Norfolk bays on the north side of the Tasman peninsula, both of which are fine land-locked harbours, in which there is anchorage and manœuvring room for the largest fleets.

The survey of the New Hebrides group has been continued; the north coast of Ambrym and west coast of Pentecost island having been completed, while large scale plans were made of various anchorages. On October 16, while the ship was at anchor off Ambrym island, having just completed the survey of the north coast, a violent eruption took place on that volcanic island, causing streams of lava to flow from the crater near the centre of the island, one of which entered the sea close to the ship, and presented a magnificent spectacle. On account of the dense clouds of smoke and dust, all surveying operations in the vicinity had to be suspended, but the vessel was employed rendering assistance to the natives, and making observations on the various interesting volcanic phenomena that occurred.

In the Atlantic Ocean a systematic examination was made of the Dacia bank in lat. 31° 10′ N., long. 13° 35′ W. It had been reported that a sounding of 12½ fathoms had been obtained on it, but the least water found on this occasion was 47 fathoms, after a careful search had been made extending over a period of four and a half days. Deep-sea soundings were obtained between Cape Bojador and Sierra Leone, and some deep soundings with serial temperatures in the Guinea and Equatorial currents, with current observations to a depth of 200 fathoms.

On the west coast of Africa surveys were made of Benguela, Great Fish bay, and Walfisch bay. A line of deep soundings was also obtained from Walfisch bay to the south-westward as far as lat. 35° 16′ S., long. 3° 6′ E., and from thence to the Cape of Good Hope.

Careful magnetical observations were obtained at Benguela, Great Fish bay, Walfisch bay, Simons Town, Cape Town, Cape of Good Hope, etc., as well as on the voyage.

In India the survey of the Coromandel coast was completed from Kristnapatam to Madras, a distance of about 75 miles. The survey of Palk strait north of Ceylon, to ascertain if a channel existed between the shoals, was also commenced at Point Pedro, and completed as far as Karrativo island before the close of the season. On the west coast, a survey was taken in hand of the coast embracing the mouths of the Indus, and completed from Manora point to the Hajamro mouth of the Indus, a distance of 50 miles, while the soundings were carried out to a distance of about 20 miles from the shore.

During the year the Hydrographic Department has published 93 new charts, improved 38 charts by the addition of 45 new plans, and made 4648 corrections to the chart plates. The number of charts printed for the requirements of the Royal Navy, for Government Departments, and to meet the demands of the general public, has during 1894 amounted to 315,867.

GEOGRAPHY AT THE UNIVERSITIES.

The following reports for submission to the Council have been sent by the Reader in Geography at Oxford, and the Lecturer in Geography at Cambridge:—

Oxford, May 30, 1895.

During the past academic year I have delivered my usual courses of lectures. In the Michaelmas and Hilary Terms they were addressed more especially to undergraduates reading for Honours in History, and in the Summer Term to members of the Day Training College. The statistics of attendance stand thus—

Michaelmas Term: 33 men from 11 colleges; 17 ladies from 3 halls.

Hilary Term: 47 men from 16 colleges; 19 ladies from 4 halls.

Summer Term: 3 men from the Day Training College.

In the first two terms the numbers were larger than in the previous year. In the last term there was a smaller class than before, because fewer students have this year joined the Day Training College.

The electors for the Geographical Studentship were the President of the R.G.S., Major Darwin, the Warden of Merton, the President of Magdalen and myself. Our choice fell on Mr. R. T. Gunther, B.A., of Magdalen College. Mr. Gunther will prosecute researches in physical geography in the Phlegræan fields of Naples. Mr. C. R. Beazeley, the student elected in 1894, has recently published a work on Prince Henry the Navigator. It is noted with interest, moreover, that Mr. G. B. Grundy, the student of 1892, last week received a grant of £25 from the Convocation of the University to assist him in exploring the island of Sphacteria.

Accurate records of attendance at the lectures of the Reader have now been kept for five years, and it may be useful at the present moment to summarize the results. Since the beginning of Michaelmas Term, 1890, 337 members of the University have passed through my classes, about one-fourth of them having followed more than one course of instruction. Every college in the University has contributed to this total. Since the beginning of Michaelmas Term, 1892, there have been, in addition, 77 "registered" lady students. Each year the lectures have been attended by foreign students resident for a time in Oxford, especially American, French, and Norwegian. I cannot help feeling that what we now most urgently need is the means of giving a more complete geographical training to a select few of our students.

I have received invitations to lecture on geographical method at various centres in the country, and have given an address on that subject to the Sheffield Branch of the Teachers' Guild, and, in London, to the Geographical Association of Public Schoolmasters.

During the past year I have delivered, at Gresham College in the City, a course of 25 weekly lectures on the "History of Geography." The course was under the joint auspices of the Royal Geographical Society and the London University Extension Society. It was intended primarily for teachers, and the Education Department makes an allowance of 60 marks in the Queen's Scholarship Examination to pupil teachers in their last year of training who pass the examinations held in connection with these lectures. At the ten lectures given before Christmas there was an average attendance of 149, of whom 102 were present also at the weekly class supplementary to the lectures, and 42 on an average sent in weekly essays. For the correction of the essays I had the able assistance of Mr. W. G. de Burgh, M.A., of Balliol College, Oxford. The examination was very kindly undertaken by the President of the R.G.S. He awarded certificates to 44 students, to 6 of whom he gave the mark of "distinction."

At the ten lectures given between Christmas and Easter, 114 of my audience continued their attendance, 102 came to the weekly class, and 37 on the average wrote essays. On three occasions I was absent owing to illness, and my place was most kindly and efficiently taken by Dr. H. R. Mill, who conducted the Easter examination. 47 students obtained certificates on that occasion, 15 of them with distinction.

The course has been continued since Easter, the audience being slightly smaller, but the number of attendants at the classes and of essayists remains as before. Towards the close of the summer those students who obtained "distinction," either in the Christmas or in the Easter examination, will be allowed to submit a thesis on some special part of the subject, which, if accepted, will entitle them to the Honours Sessional Certificate of the U.E. Society.

The students were drawn from all parts of London. The lectures were illustrated by maps projected on the screen, and were accompanied by a printed syllabus.

H. J. MACKINDER, M.A.

Cambridge, May 20, 1895.

My first year's work here having been chiefly devoted to Physical, during the past session I lectured on Historical Geography. A special lecture at the opening of the session, at which the Vice-Chancellor kindly presided, attracted large numbers, and roused considerable interest. The attendance at the regular courses of lectures was similar to that of last year, the satisfactory beginning then made being maintained. So far experience shows that, while special lectures command large audiences, the attendance at continuous courses will be limited as long as geography is not recognized in examinations. To obtain this recognition efforts are needed, and in order to be in a better position to push the claims of our subject, I have proceeded to the full degree of M.A. in this University.

In the summer of last year I gave my third and concluding courses of lectures at the Owens College, taking for subjects "North America" and the "History of Geographical Discovery." The standard of work done showed a considerable advance, and the attendance an increase, the numbers present being thirty-two and eight. A good foundation has been laid there, which should lead to satisfactory results.

During the winter I limited my work outside the University, but delivered several lectures to large audiences, notably at Chester and Burton-on-Trent.

In the University Local Examinations, which have a wide influence, some useful modifications have been made on my advice.

As to the future, there are several promising signs, not the least being the number of inquiries from well-qualified candidates for the Geographical Studentship for next year. Though offered for some years past, this studentship has never yet been awarded, from lack of a suitable candidate.

H. Yule Oldham, M.A. (Oxf. and Cam.).

THE INDIAN SURVEYS, 1893-94.

By C. E. D. BLACK.

The aggregate area surveyed on all scales during the year ended September 30 last, amounted to 127,477 square miles, this being exclusive of that embraced by the traverse operations in the Central Provinces, carried on for the purpose of supplying a basis for field surveys under the Settlement Department, and of the skeleton survey of village boundaries in Bengal, which together amounted to 3572 square miles. The general out-turn was the work of twenty parties and four small detachments, who were engaged on the various classes of survey and scientific operations, which fall within the usual scope of the Indian Surveyor-General's Department.

Triangulation in Burma was extended northwards for a distance of 90 miles along the meridian of 96° 30′ E. long., while along the coast of the Indus delta in Sind, thirty beacons were erected, at a distance of 70 miles south-east of Karachi, for the operations of the Marine Surveyors, who will be examining this shifting coast later on.

The Baluchistan topographical party, divided into four detachments, got through some important work. Captain Mackenzie extended the triangulation into the Zhob valley, before he was transferred to the Domandi section of the Afghan Boundary Delimitation Commission. Lieutenant Macaulay, R.E., with two native assistants, triangulated about 1100 square miles, and topographically delineated an area of equal extent, in connection with the same Commission in the Kurram district. Mr. Claudius was at work on military surveys round Rawal Pindi, where he was joined by Khan Sahib Abdul Guffar and Atma Ram, who had previously completed between them some 4574 square miles of survey on the ½-inch and ¼-inch scales, in the Gilgit region, amongst some of the highest mountains of the north-west Himalayas. Mr. Wainwright, with four of the best native assistants, surveyed 2508 square miles of ½-inch survey in the difficult districts of Las Bela and Wad during the cold season 1893–94. Work here was hampered through the hostility of the Brahuis, but no actual contretemps occurred.

Colonel Holdich has taken the opportunity to put together in the present report an interesting note on the antiquities, ethnography, and history of Las Bela and Mekran, which, combined with the fruit of his previous researches in the same field, furnishes a most valuable addition to the history of this hitherto comparatively unknown country. The importance of Mekran may be gauged from the fact that Colonel Holdich styles it "the 'Open, Sesame!' of India and connecting passage between west and east."

Further to the west, Yusuf Sharif, Khan Bahadur, covered about 19,000 square miles of triangulation, working from an independent base measured by himself at Jask, on the Persian coast. In spite of the opposition of the local chiefs in the Bashkurd country between Bandar Abbas and Jask, he succeeded in mapping out 10,090 square miles of this country, while his assistant, Jamaluddin, added another 1700 square miles. Imam Sharif, Khan Bahadur, brother of Yusuf Sharif, was attached to Mr. Theodore Bent's exploring party in Southern Arabia, where, as is known to our readers, he rendered a most creditable out-turn of 12,000 square miles of previously unmapped country under difficult and even dangerous conditions.

During the last cold season the Baluchistan party have furnished the survey staff for the four different sections of the Afghan Boundary Commission, while the small remnant of the party have continued the military surveys on the borders of Baluchistan and some minor work round Multan.

The Aden detachment, under Mr. G. P. Tate, completed a survey of the Aden Peninsula on the scale of 8 inches to the mile, and also a larger scale survey of the Aden and Steamer Point cantonments. The attention of the party was then turned to the portion of the Yafi'i country left unfinished by Major Wahab, R.E., in 1891–92. Accompanied by an escort of Aden troops, Mr. Tate and his party set to work in the region referred to, which is mountainous and difficult of access, some of the highest points rising over 7000 feet in height. Moreover, malarial fevers prevailed, and Mr. Tate and all the party suffered severely. Owing to the friendliness of the Yafi'i Sultan and the excellent arrangements made by the native Assistant Resident from Aden, no opposition was experienced, and the work was satisfactorily brought to a conclusion. Mr. Tate drew up an interesting description of Aden and the country of the lower Yafi'i, with a brief sketch of the history of Yemen, which has been separately published.

The direction of the tidal and levelling operations was in the hands of Lieutenant-Colonel J. Hill. The former observations were carried on at thirteen stations, two of which (Mergui and Bhaunagar) were closed on the completion of five years' registration. Since the resumption of systematic tidal operations in 1877, observations have been taken at thirty-three tidal observatories in all, of which twenty-two (including Madras) have been closed on the completion of their registrations, and eleven are now in operation.

The lines of levels consisted of a continuous line of double-levelling from the Sakti Station of the Bengal Nagpur Railway to Sambalpur, and thence across the Mahanadi to Cuttack, closing at Kendrapara, near False Point tidal station, and thus connecting Bombay by levelling with False Point and Calcutta. The lines were carried by Mr. J. Bond over rough and hilly country, covered with jungle and intersected with numerous water-courses—a difficult and unhealthy region, in which he and his detachment suffered much from illness. The result, however, as deduced by calculation from the point of origin, was only 1 foot 4 inches higher than that derived from the tidal observation at False Point, while the distance between the two points is 1185 miles.

The Burma party, No. 11, was divided into two detachments, one of which, under Colonel Woodthorpe, continued the delimitation of the Anglo-Siam boundary commenced the previous season, while the other, under Lieutenant Ryder, was engaged in the geographical survey of the south-eastern Shan States. The Anglo-French Commission, which started last November for the purpose of examining the contemplated neutral state on the Mekong river, was accompanied by Colonel Woodthorpe, Lieutenant Ryder, and two native surveyors. The other Burma party, No. 21, under Captain Longe, was split up into four detachments, which had, *inter alia*, to map out the country about Fort Stedman (97° E. long. and 20° 30′ N. lat.), and to delineate the Chin-Manipur boundary. On completion of this boundary work, sub-surveyor Mahomed Latif was told off to accompany the Manipur section of this commission on their return journey to Manipur, for the purpose of mapping the country *en route*, and also surveying a gap to the south-east of that state. This was successfully carried out, the sub-surveyor covering in a very creditable manner an area of 1054 square miles, on the ¼-mile scale, of hitherto unknown country in the hills west of the line Manipur-Tammu. The total out-turn by this detachment on the Chin-Manipur hills, including the boundary work, comprised the survey of 2550 square miles of difficult and intricate country. During the course of the operations Captain Longe and some of his followers were upset off a raft while crossing the Manipur river at night, and a treasure-chest, a box of ammunition, and a number of photographic negatives were lost or destroyed. The bulk of No. 21 party, under Captain Gordon, was engaged in the topographical survey of the southern Shan States, over 1000 square miles being covered by these operations. The climate here is excellent, and Captain Gordon remarks that a *tonga* service might be organized, which would bring one from Rangoon or Mandalay to a climate as good as Bangalore or Dehra Dun in little over 24 hours. The country is rich in minerals; lead ore is extensively mixed in the Bawsaing State, where the ubiquitous Chinaman, who is always to the fore where money is to be made, holds the contract for melting lead and silver. The possession of this mineral wealth is not a source of unmixed benefit to the state, as the surrounding hills are so honeycombed with old mines, that the people are unable to keep cattle, grazing being impossible owing to these pitfalls. Coal of fair quantity is found in Pwehla, and copper and iron were both formerly mined for in the Myelat. From an ethnological point of view the country is most interesting. In the Myelat there are over twenty different tribes, distinct in dress, customs, and often language. These tribes do not, as a rule, intermarry. Although so different otherwise in character, they resemble one another closely in some points. They are unambitious and unenterprising, but cheerful and fond of amusement, and, although constitutionally lazy, take care to work sufficiently hard to keep themselves in comfort. The wife does all the housework, and a very large share of the outdoor work as well. So important a member of the household is she considered, that in most of the states a widower is exempt from all taxation. The Shan is a born trader, and the great feature of life in this country is the bazaar, which is held on every fifth day at all the chief villages of the states. There the gossip of the neighbourhood as well as its produce is exchanged, and for a few hours in the forenoon these markets present a scene of much animation. During the colder months an extensive trade is done between the Shan States and Burma, and the traders from the states east of the Salween, with their immense herds of fine pack-cattle, preceded by a favourite bull, carrying a deep-toned bell hung on a wooden arch on its shoulders, are continuously passing to and from the plains. The principal waterway is the Inle lake (Nyaungywe State), with its influents in the valley, as well as the Balu chaung, which flows out of the lake. The boats are navigated by an amphibious tribe, the Inthas, said to have been originally brought from the Tavoy province. They build their villages on piles in the lake, and construct floating gardens close by, where tomatoes, water-melons, and gourds grow in profusion. They are expert fishermen, and supply all the bazaars in the neighbourhood with fish. Their method of rowing is peculiar; the boat man or woman—for both are equally expert—holds the end of the paddle in the hand, and propels it by the leg, which is hooked over the handle for the purpose. The country is generally fertile. Rice is the principal crop, but a little wheat, cotton, and sugar-cane is also grown, and in some parts good crops of earth-nuts are obtained; excellent oranges are grown in Pindaya and other favoured spots, and, judging from the size and appearance of the wild apple and peach trees, there should be no difficulty in cultivating these fruits as well. The country is thoroughly settled and peaceful, and the whole party moved freely throughout the district without escorts of any kind.

The above include some of the more interesting features of the field-work of the Department. At the headquarters' offices a vast amount of drawing, engraving, and other work incidental to publication was got through. Among the general maps issued during the year, were a map of Indo-China in 4 sheets on the 32-mile scale, and a military map of India and a map of the Bombay Presidency on the same scale. Of the new Calcutta Survey, 127 sheets on the 50-feet scale have been published during the year; the engraved plan on the 16-inches = 1-mile scale is not expected to be ready before the end of the present year. The heliogravure section was well employed with reproducing drawings of delicate Indian ink drawings of fishes, crustacea, and echinodermata to illustrate the zoology of the Royal Indian Marine Survey steamer *Investigator*, illustrations of coins for the Indian Museum, plates illustrative of the technical art series, and similar work. A view of Calcutta, taken from the tower of the Telegraphic Office by Mr. T. A. Pope, accompanies the Surveyor-General's Report, and, for microscopic clearness of outline and delicacy in gradation of shade, is as excellent a specimen of photographic reproduction as we remember to have seen.

THE FRANKLIN COMMEMORATION.

As Sunday, May 19, was the fiftieth anniversary of the departure from Greenhithe of the memorable Arctic expedition under the command of Sir John Franklin, the Council resolved to hold a special meeting on the 20th in commemoration of the event. In connection with this festival, some three hundred Fellows of the Society and their friends joined together to pay a visit to Greenwich for the purpose of inspecting the interesting collection of Franklin relics in the museum at Greenwich. The President and several of the Council took part in this visit, and on board were Sir Leopold M'Clintock and several other survivors of the Franklin search expeditions, as well as relatives of Franklin and his officers, and Commandant Le Clerc, as representative of the Paris Geographical Society. Two steamers were hired and left Westminster Pier at 11 o'clock on the morning of the 20th. On arrival at Greenwich, the company was received by Admiral Sir W. J. Hunt-Grubbe, K.C.B., who took a great interest in the proceedings, and by Captain Durnford, R.N., D.S. The company spent about an hour in inspecting the large collection of Franklin relics and in visiting the painted hall where there are so many portraits of England's naval heroes. Mrs. Lefroy, a niece of Sir John Franklin, had placed a beautiful wreath of flowers round his portrait in the museum. On returning on board, the company was served with luncheon while the steamers went a little way down the river. On the return journey, the magnificent Tower Bridge was opened for the special benefit of the Franklin pilgrims. At Greenwich, Commandant Le Clerc reverently placed a wreath on the obelisk erected there to Lieutenant Bellot.

In the evening the Geographical Club gave a dinner to the survivors of the search expeditions. This dinner was honoured by the presence of H.R.H. the Duke of York, while the United States was represented by its ambassador. Among the survivors of the Franklin search expeditions the following were able to be present: Admiral Sir Leopold M'Clintock, Admiral Sir Erasmus Ommanney, Admiral Sir Vesey Hamilton, Admiral Sir George Nares, Sir Allen Young, Captain W. W. May, Captain Allen, Captain Jenkins, Captain W. A. Fawckner, Captain Hull, Captain Hills, Dr. Charles Ede, Dr. F. Y. Toms, and Mr. William Dean, besides the President himself, who served in the *Assistance* under Sir Erasmus Ommanney. Other Arctic officers present were Admiral A. H. Markham, Captain L. A. Beaumont, Captain Parr, Colonel Feilden, besides Mr. Leigh Smith and Dr. W. H. Neale. Among the others present were Viscount Midleton, Lord Kelvin, Lord George Hamilton, Sir William Farrer, Admiral Sir Edmund Commerell, Admiral Sir Anthony Hoskins, Admiral Sir F. W. Richards, Admiral Sir W. J. Hunt-Grubbe, General Sir Arnold Kemball, General Sir Francis de Winton, Sir George Baden Powell, General H. D. Crozier, Admiral Dale, Dr. John Murray, Dr. Gell, Mr. P. L. Gell, Mr. John Clark, Q.C., Captain W. E. Fairholme, Mr. A. C. Harmsworth, and Mr. A. Montefiore.

The President proposed the toast of the Arctic Survivors, which was briefly responded to by Admiral Sir Leopold M'Clintock.

At the large and brilliant meeting of the Society which followed all the dinner guests were present, besides Commandant Le Clerc, the naval attaché of the French Embassy, the state of whose health prevented him from attending the dinner, although he took part in the morning's excursion and was present at the evening meeting as the countryman of the brave but unfortunate Bellot, and as the representative of the Paris Geographical Society. There were also present many relatives of Franklin and his officers, and the several seamen who had served on board one or other of the search expeditions: Mr. Mumford (carpenter's mate, H.M.S. *Resolute*, 1852–54); Mr. Hester (captain's coxswain, H.M.S.

Enterprise); Mr. Smithers (stoker, *Intrepid*); Mr. Custance (stoker, *Intrepid*); Mr. Allen (stoker, *Pioneer*). Mr. Tullit (captain of the maintop in the *Assistance*, 1850–51) had accepted the invitation, but died on March 31.

In two of the large rooms adjoining the hall, kindly lent by the Senate of the University of London, was arranged an exhibition of great interest, consisting of portraits of Franklin and his officers, of the officers of the search expeditions, pictures of Arctic scenery by Captain W. W. May and others, photographs, maps, Sir Leopold M'Clintock's sledge, and various articles more or less connected with Franklin. While some of these belonged to the Society itself, others were kindly lent by Mr. John Barrow, Sir Leopold M'Clintock, Mr. Gorman, Captain May, and Mr. Markham. One of the most interesting objects was the silver model of the *Fox*, Sir Leopold M'Clintock's ship, presented to the admiral by Lady Franklin. These exhibits were inspected with evident interest by most of the audience at the close of the meeting. The following is a report of the addresses which were given at the meeting.

The President said—

We are assembled to commemorate the fiftieth anniversary of the departure of the Arctic Expedition, commanded by our Vice-President, Sir John Franklin, on May 20, 1845. It was a memorable event, for it was a turning-point in the history of polar discovery; and there are good reasons for not allowing such an anniversary to pass by without notice. A commemoration, such as that which we now celebrate, serves more than one useful purpose. It recalls the memory of brave men who did their duty well and nobly in their generation. It revives and freshens our knowledge of their work, and of what we owe to them for the examples they have set us, and for the credit their labours have secured for our country. It enforces on our minds the lessons to be derived from the past, in our efforts to work for the present and for the future. Above all, the renewal of an interest in former achievements has a tendency to incite among our younger associates a feeling of admiration, which is a direct incentive to emulation in the same glorious field of geographical research.

For these reasons we do well to look back, from time to time, and to consider the work of those who have gone before us; and now we fix our attention on those two famous old barque-rigged vessels as they got under weigh at Greenhithe, and proceeded down the Thames just fifty years ago. They were already historical. They alone had twice sailed through the south polar pack; their names are immortalized by Mounts Erebus and Terror, on the far Antarctic continent; and, in 1845, they were once more starting on a glorious enterprise, carrying hearts full of zeal, of enthusiasm, and of devotion to their country. But we must not forget those illustrious men whose constancy and perseverance had led to the equipment of the expedition. Among them two stand pre-eminent, Sir John Barrow and Sir Francis Beaufort.

Sir John Barrow, one of the principal originators of this Society, was Secretary to the Admiralty for upwards of forty years. In that long period he was the unceasing promoter of geographical research in all parts of the world, but especially in Africa and in the Arctic Regions. To Sir John Barrow is due the renewal of polar research in 1818, and the despatch of the expeditions of Ross, Parry, and Franklin: whose perilous adventures and great discoveries excited such intense interest when our grandfathers were schoolboys. Then there was a pause; but when the Antarctic Expedition returned, Sir John Barrow once more advocated and secured that second renewal of north polar research in 1845 which we have now assembled to commemorate. He retired from the Admiralty in 1845, in his eighty-first year; and when his long and most valuable life was ended three years afterwards, he died full of hope in the success of his gallant friends in the far north. No one acquainted with Arctic history, in referring to all that geography owes to Sir John Barrow, can fail to remember what is due to his son. John Barrow, who is still amongst us, was the warmest friend that Arctic officers ever had, deeply sympathizing in their hopes and aspirations, and helping them in a thousand ways by his suggestions, his ever-ready assistance, and his kindly forethought. I am sure that every Arctic officer who recalls the memories of his own polar services, combines these memories with a warm feeling of affection for John Barrow.

Sir Francis Beaufort, who was another founder of this Society, served on our Council for upwards of a quarter of a century. He was the Hydrographer of the Admiralty for thirty years; where his influence and activity made itself felt for good. Seconded by an admirable staff of surveyors, he was able to despatch well-equipped surveying vessels in various directions; and our President, Sir Roderick Murchison, had no hesitation in affirming that the master mind of Beaufort, which directed such noble efforts during a quarter of a century, did more for the advancement of maritime geography than was effected in the same time by all the surveyors of other countries united. As a Councillor of this Society, Sir Francis Beaufort advised us to urge the Government to fulfil its duties to geographical science, and even accompanied our deputations with that object. As Hydrographer he zealously and ably seconded the efforts of Sir John Barrow, in advocating the renewal of polar research.

Sir John Franklin never slackened in his zeal for discovery while life lasted. From the day when he first beheld the seashore on an expedition from Spilsby, when a boy of twelve years old, to his death on the threshold of the North-West Passage he never swerved. No dangers could daunt him, no ill luck and no misfortune could turn him aside.

Few men had greater war services. Signal midshipman in Dance's famous action with Linois, he also served at Copenhagen, at Trafalgar, and at New Orleans. But his true work began with the survey of the Australian coasts under his relative Captain Flinders, and when, in 1818, Sir John Barrow opened the Arctic Regions as a new field of enterprise for the navy, Franklin was among the foremost of the volunteers. He commanded the *Trent* in the attempt to penetrate north of Spitzbergen in 1818, and in the following year he was entrusted with the command of the important expedition to penetrate by land to the shores of Arctic America. The story of this famous enterprise was read, with intense interest, by every schoolboy when I was one; and the zeal, energy, and endurance, under appalling circumstances of hardship and starvation, of Franklin and his companions created a profound sensation on his return. Major Rennell declared he had never heard of such trials before, or of such heroic fortitude in facing them. Franklin's second land expedition, during which he discovered over a thousand miles of the shores of Arctic America, still further increased his renown, and his name, coupled with that of Parry, became as a household word to that, and in but a slightly less degree, to succeeding generations of his countrymen. I know of no more pathetic incident than Franklin's parting from his young wife who was dying, but who urged him to place his duty to his country before his love for her. Both knew, when he sailed, that they had seen each other for the last time in this world. Franklin's dying wife had worked him a silken Union Jack, which was first unfurled when they reached the polar sea. "You can imagine," he wrote home, "it was with heartfelt emotion I first saw the Union Jack, but in a short time I derived great pleasure from looking at it."

In these two famous expeditions Sir John Franklin showed himself to be a true leader of men, resolute, firm, indifferent to hardships and dangers, but full of care and forethought for those who served under him. During his commission in the Mediterranean on board the *Rainbow*, other qualities were brought into play; and Sir John is still remembered at Patras as the saviour of that town from pillage, on more than one occasion; while his ship was a welcome refuge for fugitives, and a centre of kindly hospitality. The commander-in-chief in the Mediterranean, Sir Henry Hotham, commended Franklin's judgment and forbearance, and his calm and steady conduct under very trying and difficult circumstances. We next find him, as Governor of Tasmania, showing his ability as an administrator. Under his wise and judicious rule the debt of the colony was paid off, deficits were replaced by a surplus, a collegiate institution and a scientific society were founded, and a magnetic observatory was established; while the governor exerted himself to the utmost in assisting his friend, Sir James Ross, to perform his arduous duties connected with Antarctic exploration.

In those days Sir John Franklin enjoyed the helpful co-operation of his second wife, a devoted lady, whose high qualities were more fully brought into play when her noble exertions in the cause of the lost expedition aroused the admiration of the whole civilized world.

Sir John Franklin returned from Tasmania in 1844, to find that Sir John Barrow and Sir Francis Beaufort were on the eve of success, and that polar research was about to be renewed. He at once volunteered for the command of the expedition; and it was generally felt that the right choice had been made when the appointment was announced. This was undoubtedly the feeling in the navy, and among men of science, and, above all, among the Fellows of this Society. Sir John Franklin was one of the first to join our dining club. He was an original member of our Society, and on its first Council. He always took a deep interest in our proceedings, and he was actually one of our Vice-Presidents when he sailed from England. Volunteers literally poured in, especially from the *Excellent*, and the officers selected were among the most promising and rising men in the service. Captain Crozier, the second in command, had been three voyages with Sir Edward Parry, and had commanded the *Terror* in Ross's Antarctic Expedition—a well-tried man in the ice and an excellent observer. Fitzjames, the commander of the *Erebus*, who was a Fellow of this Society, was the life and soul of the expedition. He was among the most promising officers in the navy. He had served in the operations on the coast of Syria, and in the first China war, where his brilliant conduct was such that he was five times gazetted. He was in all the operations of the Yangtse Kiang, and received four bullet-wounds at the storming of Ching-kiang-fu—one through the body, which was extracted beneath his shoulder-blade. Fitzjames was the very *beau ideal* of an Arctic officer. Full of zeal and energy, well-informed, and endowed with a spirit of enterprise which had already been displayed in his service with the Euphrates expedition, he was also prudent and judicious. He was kind hearted and unselfish, and full of mirthful humour, which tended to keep every one cheerful around him. His powers as a humorous writer were shown in his 'Voyage of the *Cornwallis*,' a most amusing rhyming narrative of the war in China in nine cantos. Fitzjames was gifted with an intuitive insight into character, which enabled him to make allowances for the shortcomings and to appreciate the good qualities of his messmates.

It has been said that Franklin was too old for the work. No one could be so good a judge as his commander, and the opinion of Fitzjames is decisive on this point. Writing from Greenland he said, "Sir John is delightful, active, and energetic, and evidently even now persevering. What he has been we all know; and I think it will turn out that he is in no ways altered. I would not lose him for the command of the expedition, for I have a real regard—I might say affection—for him, and I believe this is felt by all of us. He has good judgment and a capital memory, his conversation being delightful and most instructive. Of all men he is the most fitted for the command of an enterprise, requiring sound sense and great perseverance."

The rest of the officers are made known to us by a few masterly and kindly touches from the pen of Fitzjames. "In our mess we are very happy," he wrote. "We have a most agreeable set of men, and I could suggest no change." He tells us of Graham Gore, who made the acquaintance of the ice during the perilous voyage of the *Terror* in 1836, and had since done good service in the China war, "a man of great stability of character, a very good officer, the sweetest of tempers, and altogether a capital fellow." Le Vesconte, who won his lieutenancy by repeated acts of conspicuous gallantry in the China war, was Fitzjames's first-lieutenant in the *Clio*. He describes Fairholme, of the Niger Expedition, as "a most agreeable companion, and well-informed man." Des Vœux, who had been naval aide-de-camp to Lord Gough, "a clever, light-hearted, obliging young fellow." Sargent, "a nice pleasant lad and very good-natured." Couch, the youngest in the mess, "a little black-haired, smooth-faced fellow, good-humoured in his own way, writes, draws, works, all quietly." Collins, the second master, was, he wrote, "the very essence of good-humour and good-nature." Then he gives us pictures of old Mr. Osmer, the purser—"merry-hearted as any young man, full of quaint, dry sayings, always laughing, always good-humoured, never a bore"—of Stanley, the able and accomplished surgeon; and of Goodsir, the naturalist. In the other ship, with such men as Irving, who had experience of rough life in Australia, and had made preparations for amusing the men in the winter; Hodgson, an officer of the highest character, and one of the leading lieutenants in the *Excellent*, with young Hornby and Thomas, the same story of a happy and united mess could have been told.

With such officers, and two gallant crews, led by our illustrious Vice-President, a large measure of success was almost certain. The scientific work was commenced at once, and it is a great satisfaction that it was not all lost. On June 28 a dredge was sunk to the enormous depth of 300 fathoms, and produced many highly interesting specimens. These were by far the deepest dredgings ever obtained up to that time, except by the Rosses, and the results, which were sent home from Greenland by Dr. Goodsir, the naturalist, were of considerable scientific value. Proceeding onwards, the instructions were to work southward from Cape Walker towards the coast of America, but an alternative route was suggested by the Wellington Channel leading north from Barrow Strait. We know what Sir John's opinion was, from one of Fitzjames's letters. "At dinner to-day," he wrote, "Sir John gave us a pleasant account of his expectations of being able to get through the ice on the coast of America, and his disbelief in the idea that there is open sea to the northward." But in all probability, when the *Erebus* and *Terror* sailed up Barrow Strait, the Wellington Channel was found to be exceptionally open, and Sir John was persuaded by his officers to try that route, for we know that Fitzjames had a leaning in favour of a way north about. One of the most remarkable voyages ever made in the Arctic Regions was the result. Franklin sailed up Wellington Channel for 150 miles, reaching 77°, and re-entered Barrow Strait by a channel which he discovered between Bathurst and Cornwallis Islands, returning to winter at Beechey Island. "Seldom," says Sir Leopold M'Clintock, "has such an amount of success been accorded to an Arctic navigator in a single season, and the results of the first year's labour must have been most cheering."

During the first winter Franklin matured his own plan of trying to force a way, by Cape Walker, to the coast of Arctic America, which he knew well, and where open water would enable him to complete the passage to Bering Strait. The absence of any document on Beechey Island points to the conclusion that the ships were blown out of the harbour by a gale, and very suddenly. Franklin then proceeded to the south, between Capes Bunny and Walker, for 250 miles down the channel which is now known by his name. The ships were beset on September 12, near the coast of King William Land, but they were now close to their goal, and they wintered in the full expectation of achieving the grand object of the enterprise in the next season. In their two first navigable seasons no expedition had ever done so well. In the spring of 1847 Graham Gore and Des Vœux, with a sledge party, landed on King William Land, probably to connect Cape Victory with Cape Herschel, by doing which the north-west passage was discovered. On June 11, Sir John Franklin died in the justifiable hope that the ships would be able to complete their great work in that season. He must have taken his last farewell of his beloved companions, happy in the full expectation of their success, and in the consciousness of having done his best. Thus ended a noble life passed in the zealous performance of duty. Sir John died in the midst of his discoveries. There could be no happier, no more successful, no more glorious end.

Sir John Franklin's attempt was admirably conceived, ably and resolutely conducted, and was within measurable distance of success. His deductions were correct, based on the then existing knowledge. He knew that if he could reach the coast of the continent, he would find open water to take him to Bering Strait. He steered south, and succeeded in navigating a long and usually ice-encumbered channel—an achievement calling for no small amount of skill and good seamanship. It has never been done since. But his chart told him that King William Land was connected with Boothia. Had he known that it was an island, and that there was a channel to the eastward, he might have passed on. As it was, there were physical causes, then unknown, which made the passage by a western channel impossible; 80 miles more would have done it, but the door, by that route, is for ever closed by ice. For this is the point where the Atlantic and Pacific tides meet. The heavy ice, pouring down M'Clintock Channel, impinges on this coast of King William Island, and can never be cleared away. A long series of tidal observations in numerous positions enabled Mr. Houghton to establish this fact long afterwards. But it was unknown to Franklin and his officers; and when a third winter became inevitable, the outlook was very serious. We know that Crozier and Fitzjames made most careful preparations for a retreat during that anxious third winter, especially in fitting and adapting the boats for an ascent of the Back River. We know that they landed the surviving officers and men in April, 1848; and we know that they commenced a hopeless retreat. In the beautiful words of my dear old friend Sherard Osborn, who was also the friend of Irving, Fairholme, Hodgson, and Des Vœux, among those lost ones, "They pass from sight into the snowstorm which the warm south wind kindly sends to shroud the worn-out ones, who gently lie down to die; and they died so peacefully, so calmly, with the mind sweetly wandering back to the homes and friends of their childhood, the long-remembered prayer upon their lips, and their last fleeting thoughts of some long-treasured love for one they would one day meet in heaven." This is surely enough. Let us not "attempt to lift the veil with which the All-merciful has been pleased to shut out from mortal ken the last sad hours of brave men."

For long before this, the battle had been fought and the victory won. Every Arctic Expedition is a success if it crosses the threshold of what was previously unknown. This is the proper test; and, when tried by it, the Franklin Expedition was a most remarkable success. The voyage up Wellington Channel to 77° N. and back is a wonderful and unequalled feat. The voyage down Franklin Channel is a still more striking achievement. The discovery of the North-West Passage was a glorious crown to hard work well and nobly done.

There are many who can remember the deep anxiety of the whole nation, turned into mourning mingled with admiration, when M'Clintock brought back the last sad news. But we no longer mourn for our Vice-President and for our associate Fitzjames. The navy no longer mourns for its gallant officers and men. The nation no longer mourns for those who died so bravely in her service. Another feeling has taken the place of that sorrow which prevailed when the wounds were fresh. Franklin and his companions are among the *Dii Majores* of geographers and of sailors. They are the examples which we hold up for imitation; their deeds incite successive generations to go forth and to do likewise. And their expedition forms a turning-point in the history of exploration. These, indeed, are the reasons for our commemoration; and they are strong reasons.

For of what has the departure from Greenhithe on that third Monday of May, 1845, been the precursor? It not only commenced the work of Franklin and his companions, but, through that work, it was also the precursor of all that followed. The nation was deeply moved when the *Erebus* and *Terror* did not return. Then came the search expeditions, which were continued, in various directions, for the next ten years. Relief and succour, if not too late, was our aspiration; if too late, then the sacred duty of saving the deeds of our countrymen from oblivion. A woman's devoted love, and a generous nation's sympathy, enabled this to be done—"enabled the searchers," in Osborn's words, "to weave together the story of a glorious achievement, and to secure to Franklin and his followers the honour for which they died." Incidentally, however, the Arctic search expeditions did much more than this. They developed the system of sledge-travelling, which has since done so much for geographical discovery. They explored thousands of miles of previously unknown country, increasing materially the sum of human knowledge.

These expeditions also furnished an admirable training for many officers and men, most of whom did good work afterwards in the regular service. Thirty-three gallant officers who went out to search for Franklin and his companions happily survive out of the 145. We have the pleasure of welcoming fourteen* of them here to-night, to celebrate the fiftieth anniversary of the departure of those for whose sakes they went through such perils and hardships in the frozen north. I rejoice also that to-night we welcome the presence of four or five of the survivors among the men who served in the search expeditions.† "On them fell the hardest work," wrote Sherard Osborn, "to the officers fell the honours," although they also were ever zealous, ever ready for any work that came to their hands to do, "yet none excelled the men in pluck and in sanguine hopefulness for success. They had their moments of pleasure too while away sledging, and plenty of them, in spite of cold, in spite of fatigue. There was honest congratulation after a good day's work; there was the time after the pemmican had been eaten and each man, drawing up his blanket bag around his chin, sat, pannikin in hand, and received from the cook the half-gill of grog. After drinking it, there was sometimes an hour's chat, during which there was more hearty merriment, I trow, than in many a palace, dry witticisms or caustic remarks that made one's sides ache with laughter."

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* Admiral Sir E. Ommanney, C.B., Admiral Sir Leopold M'Clintock, K.C.B., Admiral Sir George Nares, K.C.B., Sir Allen Young, C.B., Sir R. Vesey Hamilton, G.C.B., Captain Allen, C.B., Captain May, Commanders Hull and Jenkins, Captains Hills and Fawckner, Mr. Dean, Drs. Ede and Toms.

† Tulitt (Captain M. T.), *Assistance*, 1850–51, accepted the invitation, but died last March; Hester (Captain Cox.), *Enterprise*, 1850–54; Bidgood (dog-driver), *Resolute*, 1852-54; Mumford (carpenter's mate), *Resolute*, 1852-54; Smithers (stoker), *Intrepid*, 1852-54; Custance (stoker), *Intrepid*, 1850–51; Allen (stoker), *Pioneer*, 1852–54.

They could play, but, by Jove, they could work, impelled as they were by the earnest hope of finding and relieving the lost ones. All honour to the Arctic officers, and all honour to the men.

And let us not forget our generous friends who came forward to help us in the hour of need. Let us remember the sympathy of the French nation, and how France sent two of her officers, Lieutenant Bellot and Lieutenant de Bray, to aid in the search for our missing countrymen. Bellot's untimely death formed a tie of sympathy between the two countries, which is commemorated by the obelisk at Greenwich, erected by Sir Roderick Murchison and the Fellows of this Society. Some of us visited the Bellot monument this afternoon, when Captain Le Clerc, who is deputed to represent the Paris Geographical Society, deposited a wreath on it.

Let us remember, too, the munificent generosity of Mr. Grinnell, and the cordial sympathy of the United States, and how the *Advance* and *Rescue* were despatched to aid in the search. Brave and true-hearted men were the leaders of those tiny vessels, and well was their story told by my old friend Elisha Kent Kane. Several now present will remember the brief but pleasant exchanges of visits between American and English searchers alongside the fast ice of Griffith Island, in September, 1850. Both to the French nation and to the American nation our warmest acknowledgments are for ever due, for their generosity and their sympathy in the days of the Franklin search.

Those Arctic search expeditions had another permanent effect. They aroused the emulation of other countries, thus ensuring a continuance of that work which was commenced when the *Erebus* and *Terror* sailed from Greenhithe. In the years following the conclusion of the search work Americans, Germans, Austrians, Swedes, and Dutch were in the field, doing good service for geography.

Meanwhile the enthusiasm for polar research was maintained in this Society, and throughout the country by its staunch friend Sir Roderick Murchison, while Sherard Osborn, with that determination to win which characterized him, went on pegging away until our Government resolved to send another Arctic Expedition. The meeting of this Society at which my old messmate Sherard Osborn opened the campaign, on January 23, 1865, was one of the most crowded and the most enthusiastic I ever attended. "We are no more prepared to turn our backs upon the Arctic Regions because Sir John Franklin died off King William Island," he declared, "than to do so to an enemy's fleet because Nelson fell at Trafalgar." Murchison and Osborn were warmly seconded in their efforts by that noble and patriotic woman, our Gold Medallist Lady Franklin. So another naval Arctic Expedition left our shores in 1875, planted the Union Jack in 83° 20′ N., and brought back a rich harvest of results in all branches of science. Since the return of Sir George Nares the feeling in favour of completing the exploration of the polar regions, north and south, seems to me to have received a fresh impetus, and scarcely a year has passed without some good Arctic work being done.

At this moment there are at least three expeditions at work within the polar circle, Peary in northern Greenland, Nansen crossing the pole, and our countryman Jackson exploring Franz Josef Land. But we are now looking with greatest hope to the southern polar region, where the extent of unknown land is largest, and the scientific results most important. Antarctic work brings back to us fresh memories of those whose achievements we are now assembled to commemorate. It is more than fifty years since the last Antarctic Expedition returned, and then Sir John Franklin, as Governor of Tasmania, was doing his utmost to assist its gallant leader, Sir James Ross, while Crozier of the *Terror* was second in command. Such memories incite us to fresh and renewed efforts in advocating the great cause to which England mainly owes her high position among the nations, the cause of maritime enterprise and discovery. For to look back on the past strengthens and invigorates us in our labours for the present and for the future. We look back then at Greenhithe, and at those two brave ships moving down the river just half a century ago, as the starting-point whence we trace a continuous stream of high-souled effort, and of magnificent results, down to this present day, when we strive to make an Antarctic Expedition, or at least a renewed effort to obtain its despatch, the chief and the most practical outcome of our Franklin Commemoration to-night.

Admiral Sir LEOPOLD M'CLINTOCK: Our President has very kindly invited me to say a few words. I am glad to do so; but I feel that I *must* preface them with what is uppermost in my thoughts. I therefore take the liberty of offering him my most hearty congratulations on the able and eloquent address which he has just delivered. I also wish to say how deeply I sympathize with one sentiment he has uttered; which is, that we should remember the labours of the men as well as of the officers. I beg to emphasize that sentiment; it is never absent from my mind. My success in Arctic service is mainly due to the willing work of the fine fellows I have had the honour to command. I gladly avail myself of so appropriate an opportunity to mention *one or two conclusions* which my long searching experience has led up to. In order to do so accurately, I have put my ideas on paper.

It fell to my lot, in the month of May, 1859, to trace the footsteps of Franklin's retreating crews along a most inhospitable shore, for about 150 miles. In this most anxious duty I was very ably assisted by Lieutenant Hobson, who led a separate search-party from the *Fox*, and who twice sledged over most of this same ground. Having very closely examined the numerous traces left there by the lost crews, I was, of course, most deeply impressed. Let me remind you that the effect of extreme cold is to arrest decay, insomuch that all the relics, which had lain there for eleven years when I saw them, seemed as if they had only been exposed for so many months. The impression I then received, and which I still retain, was that the most careful and most anxious consideration had been given to the preparations for that terrible retreat towards the Hudson Bay Territories. Its nature was clearly understood by its leaders.

On landing from their ships on April 24 or 25, 1848, everything which was not absolutely necessary for the contemplated journey was thrown away ; only boats on sledges, food, clothing, and three or four guns were retained. The route adopted was the shortest possible ; there was no straggling away from it. Evidently they all worked together, the strong helping the weak. It was plain that able leaders had faithful followers, and that the most perfect order prevailed. But the task was far too great for men already exhausted by three years of hardship and much privation ; both their strength and their supplies failed, and at *that season* the snow-covered land afforded no sustenance whatever. To the last moment of their lives this heroic band of Christian men proved themselves worthy of the land which gave them birth, of the noble profession in which they had been trained, and of the past fame of their veteran leader—a gallant war officer and a Godfearing seaman, as were so many of our renowned Arctic worthies. *Once*, we are told by the Esquimaux, they came across a few natives, and encamped close to them ; but the natives, seeing that the white men were almost destitute, feared to remain, and went away. They *need not* have feared, for those starving white men were under discipline. We have strong proof of this in the fact that the natives were not despoiled of their food, nor molested by them in any way whatever.

In laying down their lives at the call of duty, our countrymen bequeathed to us a rich gift—another of those noble examples not *very rare* in our history, and of which we are all so justly proud, one more beacon light to guide our sons to deeds of heroism in the future. These examples of unflinching courage, devotion to duty, and endurance of hardship, are as life-blood to naval enterprise.

The natural sequel came, namely, the long-continued "Franklin search," persistently followed up to its completion. Being one of the searchers, I must not allude to it further than to say that it will serve the purpose of showing to future generations that England never abandons those whom she sends forth in her service.

Still, it was hoped that some further records or documents of the lost expedition might yet be found buried under some cairn. With this hope strong in his mind, Lieutenant Frederick Schwatka, U.S.A., explored King William Island in 1879. He carried out an exhaustive search during the summer months, when the ground was entirely free from snow ; he found numerous relics still strewed about ; but during the twenty years which had elapsed since my visit in 1859, the Esquimaux had been over the ground, had carried away whatever was useful to them, had pulled down the cairns, and had even opened the graves. We must all feel the greatest regret that Lieutenant Schwatka's exhaustive search was unrewarded beyond the finding of four despoiled graves, and portions of six skeletons. His researches were, however, very valuable for the many interesting details which they supplied in confirmation of previous statements, and for dispelling many illusory reports at one time in circulation. The various interesting conversations held between him and the Esquimaux are given at some length in the published account of his unique journey.

And here I feel bound to remark that the generous and sympathetic help of our American kinsmen, throughout the whole period of the Franklin search, marked the beginning of that drawing together of the two great Anglo-Saxon nations, which is so striking a feature of the present day, and of which our children may reap the full fruition.

The PRESIDENT : I have just received a telegram from the survivors of the Arctic and Antarctic Expeditions residing at Chatham, expressing their cordial sympathy with the objects of to-night's meeting, sent by John Parry, Royal Marines, of Sir James Ross's ship *Erebus.** I will now ask the American Ambassador whether he will be so kind as to address the meeting.

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* A letter was also received from eleven resident pensioners in Sir John Hawkins's Hospital for old seamen in the Royal Navy, Chatham, offering hearty congratulations and good wishes.

Hon. THOMAS F. BAYARD: It is quite impossible, upon such an occasion as this, that the voice of my country should be inarticulate in the presence of the partakers in the glory of advancing geographical exploration, as I have heard the men themselves in the voices of your President and of Sir Leopold M'Clintock. I wish that some of my own countrymen who have assisted in the great work could be here in visible presence to speak words of fellowship and sympathy. I must, for want of better, say one word for them. This map and the wonderful thoughts it generates appeal to our feeling and our imagination. It seems—I can scarcely call it ghosts—but it seems to be the realities of those who have done so much to make that map full of meaning to us. If there shall stand the names of Franklin, of Ross, of M'Clintock and of Austin, and a great list of their peers and associates, —if they shall be found keeping guard over the secrets of nature in that remote region, they will not be found alone; the names of Grinnell, and of Hayes, and of Kane, and of Peary, and of Holland and Melville and Hall, will be found with them. If the noble *ardor Britannicus* shall plant your banner at the North Pole, it will not be solitary, for the *animus Americanus* will be there also. Go where you will, my kindred people, you will not be without the hearts and souls of Americans to accompany you in the noble endeavour to advance knowledge of the world we live in.

The PRESIDENT: Captain le Clerc has been deputed to come to this meeting to represent the French Geographical Society, and express its sympathy.

Captain LE CLERC: It is a great honour for me to have to answer for the Society of Geography of Paris. It is very kind of the President to have associated the name of Bellot in such a touching manner with the name of the glorious and venerated Sir John Franklin which is to-day commemorated. It is a great honour that his countrymen will certainly feel. England is a country which is second to none for hospitality; but there are two kinds—the material and the moral hospitality. The material hospitality, we all know how England is celebrated for that; the moral hospitality, which is the most precious one, England never grudges it to anybody who may work for science, civilization, and over all to those who plough the main to snatch from it the mysteries of nature. This last hospitality England has bestowed on Bellot's name and memory in a manner which I have most keenly felt to-day as a Frenchman and an officer in the French navy—I allude to the monument on the banks of the Thames, which has been erected by English care near the relics of Sir John Franklin. I think every countryman of mine should feel proud that the ships going up and down the Thames every day, when they ask, "What is this monument?" are answered, "It has been erected to a French officer—to Lieut. Bellot, by England." In him England wished to honour those qualities which are so dear to her, and of which you may have a just idea if you have read the admirable letters he wrote to the noble lady, the companion of Sir John Franklin. Also did England wish to honour one of our officers, who I won't say devoted his life to England, but devoted it to an enterprise which emanated from England on behalf of one of her sons who perished for the interests of human kind.

Admiral Sir EDMUND COMMERELL: I am called upon by the President, as a pure outsider, to give you a little bit of opinion on Arctic Expeditions, because I have never been there, though I have been very near there. I volunteered to go with Sir John Franklin in 1845. Lieutenant le Visconte, whom I was serving with at that time, and Captain Fitzjames, whom I served with in a ship previously, did the best they could with Sir John to give me a chance of going; but, ladies and gentlemen, I am happy to tell you that I was too young at that time. My experience of over fifty years in the service has taught me that you can look nowhere for better officers, in the ordinary run of duty, and better seamen, than in these Arctic Expeditions. We know very well that it has been an excellent school in every way: an excellent school in hardihood, I may say almost of life, because I believe men who serve for two or three years, and survive an Arctic Expedition, are pretty certain to live, according to the survival of the fittest. I had for my coxswain a man who is alive now, and I am very sorry to see he is not here to-night. This is a man called Palmer, who was coxswain with Captain Markham on the Nares' expedition, and I believe he went further towards the North Pole almost than Captain Markham; and I know this much, that that man was as hard as nails. I thought myself I was pretty tough, certainly I was a few years older, but when we had been on the water together for three hours he beat me into fits. Well now, gentlemen, there are one or two celebrated officers whose names we must not forget, because they have not been forgotten by the President —one Sherard Osborn. I had the honour of serving with that noble man for a long time in the Crimea: a more able, energetic, earnest, gallant man I never came across in all my life; he was always forward in Arctic Expeditions, and untiring; so when it came to war, there was Sherard Osborn in the forefront. We remember him afterwards in China, as a leader of an expedition which was to do great good for China, and if he had been left to himself, I have no doubt it would have done great good; but unfortunately China did in those days what she has done now—when they have good men, instead of using them, they put them on one side to make way for their own very foolish leaders. Now, having made these remarks, and as it is getting late, I will say this: I believe in the future that neither Arctic nor Antarctic work will cease, as I am perfectly certain it is the best school we have for our navy.

Dr. Toms, R.N.: I was the last man who saw Bellot alive. I accompanied him when he got on the iceberg that overturned and lost him his life. I was a messmate of Sherard Osborn for more than two years, and I maintain what the last speaker said—that he was the bravest and most courageous man in the service.

The President: As it is getting late, I think we must wind up this very interesting discussion. We have to thank the American Ambassador and the representative of the French Geographical Society for the kind words of sympathy they have spoken to us. We have great pleasure in welcoming here to-night both old and young.* As I said before, we have with us representatives of officers and ships' companies of the search expeditions; we have several relations of Sir John Franklin, and of his officers; we have other explorers who have been in the north; we have many officers who took a deep interest in the work being done during the search for Franklin; we have young officers from Greenwich; and I am happy to say we have six young cadets from the *Worcester*, who, I hope, will distinguish themselves in years to come. I feel sure that this celebration of the sailing of Sir John Franklin, this commemoration of his work, will not soon be forgotten by those who have taken part in it. Our knowledge has been improved and refreshed by a renewed study of former achievements, and we have contemplated the noble work done by our predecessors through devotion to duty, through desire to do well, and determination to succeed. All these are lessons which have been taught to us by this commemoration, and I trust, therefore, that it has been not only interesting, but also that it has served for our edification in many ways. We have to thank H.R.H. the Duke of York for his kindness in coming: he naturally takes a deep interest in the work of naval officers and also of the men of the navy. I hope that you will now adjourn to the other room, and examine the portraits of our Arctic officers collected there, and many relics of the Franklin and other expeditions.

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* Mr. John Franklin Wiseman, the eldest great-grandson of Sir John Franklin, wrote to the President to express his warm sympathy with the feelings which led to the commemoration, and his regret that his engagements at Clifton College prevented him from being present.

BATHYMETRICAL SURVEY OF THE ENGLISH LAKES.*

By HUGH ROBERT MILL, D.Sc., F.R.S.E.

With the support of the Royal Geographical Society, and the approval and assistance of the Ordnance Survey, I have been able to construct the accompanying maps of the beds of the largest English lakes. The following paper explains the object, methods, and results of the work.

From the standpoint of the physical geographer, the mapping of the surface of the Earth should refer to the forms of the solid crust, disregarding the fluid envelopes, the aqueous as well as the aërial. At an early stage of exploration, the distinction between land and water is necessarily the fundamental contrast: land is represented on maps with its valley-lines defined by streams, and its mountain masses sketched in from general observations; water remains a blank. But when scientific surveying reaches such a high level of efficiency as it now does in this country, it is neither rational nor right that the best maps should show the minutest detail on land, and only meaningless lines on the water.

The Hydrographic Office of the Admiralty is charged with the preparation of charts showing the configuration of the sea-bed, not only along the coasts of the British Islands, but in every part of the ocean to which the British flag is carried. This work is unexcelled for accuracy, but it is practically bounded by the dividing-line between salt water and fresh. Only in the case of Loch Ness, Loch Lochy, and the other lakes joined by the Caledonian canal, of Loch Lomond, and of Loch Awe, exceptions have been made, but the other large navigable inland lakes of Britain have never been officially charted. Steamers ply regularly on Loch Tay, Loch Katrine, Loch Eck, Windermere, Ullswater, and Coniston, but their skippers have only the vaguest notions of the depths over which they float. Contour-lines deduced from the soundings which form the basis of this paper are now, however, being placed upon the Ordnance maps, and they will help to complete the scientific delineation of the country.

Official surveyors have mapped the lakes of France and Switzerland by means of the most elaborate and accurate soundings ever made; indeed, there are few, if any, parts of the Earth's surface every inequality of which is so minutely known as the beds of the lakes of Geneva and Constance. In Austria and Germany, the researches of individual scientific men have sufficed to allow the lakes to be mapped with some approach to accuracy. In America many lakes have been mapped by the Geological Surveys. Several of the fresh-water lakes of Scotland have been surveyed by private enterprise, or by the officers of the Geological Survey.

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* Paper read at the Meeting of the Royal Geographical Society, on June 18, 1894. Revised in May, 1895. Maps, p. 108.

I. Configuration of District.

This paper is confined to the consideration of the group of lakes which occur in the mountainous region of north-western England, occupied by the counties of Lancashire, Westmorland, and Cumberland. The region is one of very distinct physical individuality, and is familiarly known as the Lake District. The sea borders it on the west, the flat shores of Morecambe bay and the Solway Firth shut it in to south and north, and the valleys of the Eden and the Lune interpose a trench between its mountainous border on the east and the Pennine range. Geologically, also, the Lake District is distinct from its surroundings, being composed centrally of highly complicated volcanic rocks—lavas and bedded ash, the latter often altered into slate—while the coal-measures and new red sandstone form irregular outer rings on the lower ground. The orography of the district, as represented in the general map No. I. (where the limits of the drainage area of each lake are shown), may be looked upon as carved out of a great dome, cleft from north to south through the centre by two long depressions. The highest point in the eastern depression—Dunmail Raise—is only 800 feet above the sea. This cleft contains Thirlmere, Grasmere, Rydal Water, and Windermere. The western is crossed by a narrow ridge—that of Stake Pass, 1500 feet high—and it contains Derwentwater, the extinct lakes of Borrowdale and Langdale, and Coniston Water. The central mass between the two depressions contains the heights of the Langdale Pikes and Sergeant Man. The eastern mass contains the summits of Helvellyn (3118 feet), Fairfield, Red Screes, and High Street, and long valleys radiate from it to north-east and south-east. Two of these valleys contain lakes, Ullswater and Haweswater. The western mass is more deeply cut by valleys, forming groups of heights dominated by Coniston Old Man, Scafell Pike (3210 feet), Scafell (3162), Great Gable, the Pillar and Steeple, High Stile, and Grasmoor. Valleys run in all directions radially, north, north-west, west, south-west, and south from this mass, and these radiating valleys contain Buttermere and Crummock Water, Ennerdale Water, Wastwater, Coniston Water. The valleys are more numerous and picturesque than those on the east, as might be expected from their position facing the prevailing sea-winds. The isolated group of Skiddaw (3054 feet) rises from the low ground north of the mouth of the double central depression, and gives form to its lower end.

The simple symmetry of the mountain and valley system of the Lake District bears little or no relation to the present geological structure. Thirlmere is partly outlined by a fault, and Ullswater lies in part on a tongue of softer rock between two harder masses; but for the rest, the drainage-lines cross the geological boundaries at all angles, with no perceptible change. They bear testimony to an earlier and simpler structure, when a dome of vanished rocks spread over the area, the dissected skeleton of which, worn by the warfare of air and rain and ice, now alone remains. That the radiate symmetry of the Lake District is too distinct to be accidental will appear from Fig. 1, on which concentric circles of increasing radius are described from what was possibly the crown of the ancient dome, and is now the middle of the small central mountain mass lying between the Thirlmere-Windermere and the Langstrath-Borrowdale depressions. The exact centre chosen for this purpose is the point midway between Stake Pass and Dunmail Raise, lying on the western slope of High Raise. A circle of 3 miles' radius from this centre touches the head of Grasmere on the southern drainage, and very nearly reaches the head of Thirlmere on the northern. A circle of 6 miles' radius may be taken as the commencement of the

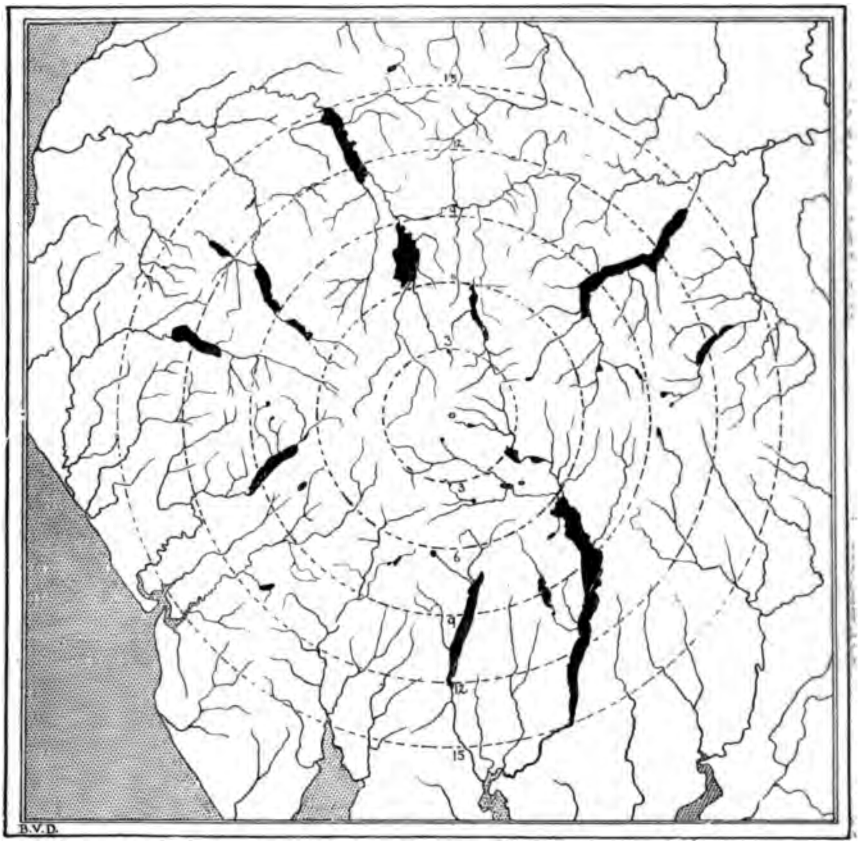

FIG. 1.—THE RADIATE SYMMETRY OF THE LAKE DISTRICT, SHOWN BY THE STREAM-LINES.

radiating lake-system. It touches the head of Windermere on the south, and of Derwentwater on the north, and comes within 1½ mile of the head of Coniston on the south, Ullswater on the north-east, and Wastwater and Buttermere on the west, reaching the valley flats over which these lakes formerly extended. It touches the outlet of Thirlmere. A radius of 9 miles passes a little to the south of the deepest part of Windermere on the south-east, cuts the deepest part of Ullswater on the north-east, the northern end of Derwentwater in the north-north-west, passes through the upper end of Crummock Water on the north-west, a little south of the deepest part of Wastwater on the west-south-west, a little north of the deepest part of Coniston on the south, and through the centre of Esthwaite. This circle may be termed the central line of the Lake District, passing, as it does, through or near the deepest part of the four deepest, and across the alluvial flats which separate the upper and lower members of the two lakes which were once single, but are now divided. A circle of 12 miles' radius from the same centre cuts the lower ends of Coniston Water, Windermere, the middle of Haweswater, and the lower end of Ullswater, the upper end of Bassenthwaite, and the middle of Ennerdale. Finally, a circle of 15 miles' radius just touches the outlets of Bassenthwaite in the north-north-west, and of Windermere on the south-south-east, and it includes every lake and tarn of the Lake District (except the little Over Water on the north slopes of the Skiddaw elevation), and almost all the land of greater altitude than 1000 feet.

Between the nine great radiating valleys, the beds of which are hollowed into lake-basins, there are several important valleys in which lakes do not now occur, but the streams flowing down these often traverse long stretches of flat meadow-land bearing undoubted marks of the existence of lakes at an earlier time. Four may be mentioned—those of the Esk and Duddon on the south-west, between Wastwater and Coniston; Great Langdale, in line with the upper reach of Windermere; and Long Sleddale on the south-west, between Windermere and Haweswater. Thus the Lake District is a symmetrical result of land-shaping agencies which have evidently acted in lines directed outwards in all directions from the centre indicated, in such a way that the valleys now represent spokes of an irregular wheel; and each valley is associated with one or more lakes, actual or extinct. There are two instances of valleys dipping inward toward the centre of the district—Lowes Water on the north-west, draining to Crummock Water; and the Glenderamackin Beck, from the slopes of Saddleback in the north-east. These suggest a slight raising of the rim of the wheel of lakes, and such a raising of the rim all round the 15-mile circle would, according to one geological theory, account for the formation of the lakes by the elevation of the lower ends of earlier erosion valleys. Another theory of the origin of the lake-basins is that they were hollowed in the floors of the valleys by the abrasion of the ice-cap which formerly overrode the district, flowing outward from the orographical centre, and of the glaciers which marked its gradual disappearance. My object in this work has been purely geographical, and reference is made to geological theory merely to suggest one interesting direction in which the results of the geographical investigation may be applied by specialists, not in order to bring forward here any controversies belonging to the sister science.

Since writing this section I have seen the old 'Guide-Book to the Lake District,' in which the poet Wordsworth describes the form and scenery of the region he knew so well, and I acknowledge with pleasure that his simile of a wheel fully embraces the idea of radiate symmetry to which I have referred. Wordsworth is careful, also, to point out the different orders of scenery in the valleys, depending on their mode of formation, and he dwells especially on the low deltaic headlands which diversify the lake-shores, and threaten, as he recognized, to fill up the lake-basins.

II. LIMNOLOGY.

While the lake-basins might truthfully have been described as unknown England, they had at various times been sounded in an irregular way. The number of soundings taken in many of the lakes would have sufficed to give a good idea of the configuration of the lake-bed if they had been made systematically with that object. Limnology, the science of lakes, is a branch of geography which has budded but recently, and is still little cultivated. Most of the facts concerning it have been ascertained by geologists often in search of evidence to confirm or overthrow special theories, and by naturalists while dredging the fauna of the depths. Many soundings have also been made simply to find the deepest part, and satisfy local curiosity as to the greatest depth. Some knowledge of the general character of lake-basins enables one to arrange soundings which will not only satisfy curiosity, but also permit the depths to be accurately mapped, and display their true character, allowing the average depth and total volume to be calculated.

Geography, rightly considered, is not a mathematical science concerned with the description and delineation of an unchanging arrangement of surface features. It has to take account of processes of change, to concern itself with a certain range of time past and time to come, in order to comprehend the present position of affairs. In the case of limnology, a lake-basin represents the product of past changes, in process of further change to some different future condition. This change is not always of the slowness characterized as "geological." Mr. Grant Wilson found, in 1888, that the delta at the head of Loch Tay had advanced one-third of a mile since the Ordnance Survey of the district in 1861 *—a length of 8 inches on the largest-scale map. The deltaic land at the head of Windermere shown in Fig. 2 closely resembles that at the head of Loch Tay. The rocky promontories seen on the right of the stream were evidently rocky islands added to the land by deposits from the river. The original hollow may be produced by Earth-movements, or by glacial scour, or by some obstruction being laid down across a valley, and, once formed, its filling with water is a question of climate. When rainfall exceeds evaporation, the streams entering the lake maintain the level of its surface as far above the lip of the lowest part of the edge as the escaping river permits. If evaporation were in excess, as in Central Asia or Western America, the lake-basin could not be filled sufficiently to overflow.

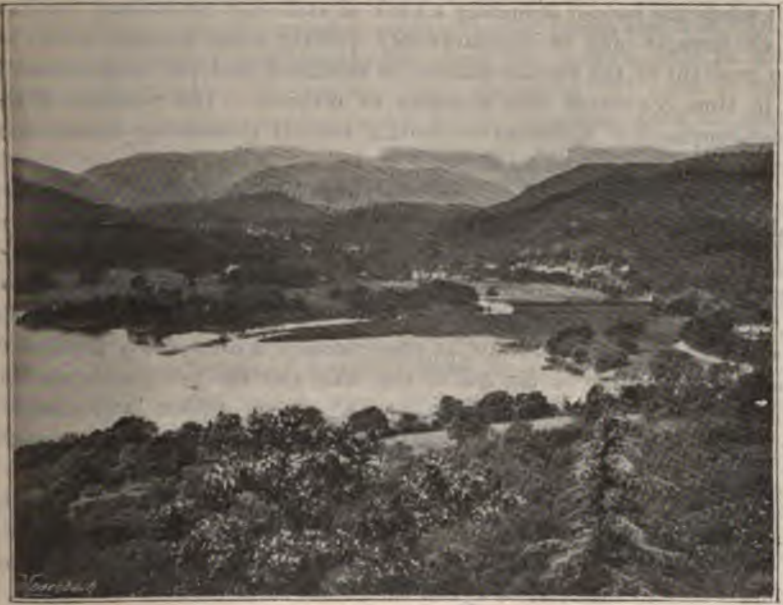

FIG. 2.—HEAD OF WINDERMERE, SHOWING DELTAIC LAND.

(*Photograph by Mr. A. Pettitt, Keswick.*)

The processes of change in a lake-basin are more readily seen than the causes of formation. They tend, as a rule, toward the effacement of the lake by filling up and draining. The former takes effect by the pouring in of sediment, washings of the land, pebbles and sand crushed by the collision of blocks of rock in mountain torrents, or finer particles of clay, where the streams cut through ice-formed deposits. The organic life of the lake aids the process: the minute organisms, secreting carbonate of lime and silica, gradually form beds of marl, and plant-growth in the shallow water converts the clayey or sandy soil, formed by stream detritus, into a spongy mass, felted by decaying root-fibres, and tending to raise the level of the lake-bed more rapidly than any other agent. The second process is the eroding action of the escaping stream on its bed, which gradually lowers the outlet, and thus ultimately tends to drain the lake. When the lake occupies a true rock-basin this process is extremely slow, because the clear water, freed from sediment by its repose in the lake, has little erosive power; but when the barrier is merely a bank of stiff clay containing boulders of all sizes, it may be comparatively quickly worn through, provided the gradient of the stream-channel is sufficient, and the lake behind it is in time converted into a marsh or meadow. The valleys in the neighbourhood of Haweswater contain several interesting instances of such naturally drained lakes (see Fig. 14).

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* 'A Bathymetrical Survey of the chief Perthshire Lochs and their Relation to the Glaciation of that District,' *Scottish Geographical Magazine*, vol. iv. (1888), p. 251.

In a newly formed lake, the coast-line follows the contour of the valley sides, the rocky parts as a rule appear as promontories, and the inlets of streams are bays where the contour-lines retreat up the gulley the stream has carved for itself. Professor Forel has pointed out * that if the land be stationary with regard to vertical movement, this state of matters cannot long continue, as every stream throws down its load of stones in flood-time on the bed of the lake, and the pile grows until it forms a cone of dejection or delta, over which the stream may meander in several channels. Such a delta causes a low promontory of shingle or sand to grow out from the edge of the lake, and in time the promontories would tend to be of soft low ground, while the original rocky masses between neighbouring streams would be left guarding the heads of bays (see Fig. 9). Thus the character of cliff and promontory may afford a clue to the relative age of the actual coast-line.

If the bed of the lake is undergoing depression through Earth-movements in comparison with the surrounding land, the growth of deltas may be so far checked as to be non-apparent, and the streams would empty themselves into the heads of narrow bays or fjords. This is not the case in any of the English lakes, with the possible exceptions of Pull Wyke on Windermere and Howtown Wyke on Ullswater. Stones or soil slipping down a steep hillside into a lake, like the screes on Wastwater and Ullswater, may be looked upon as special cases of deltaic action in which the detritus bears an overwhelmingly large ratio to the running water. Scree-shores present some interesting features, which will be referred to in detail when the separate lakes are described.

In lakes so narrow and sheltered as those of England, wave-action counts for little, although M. Forel has shown, in his great treatise

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* 'Le Leman,' vol. i. Geneva, 1892.

on the Lake of Geneva, that in a wide expanse of water it has a very marked effect. Even in the English lakes the result of wave-action has been traced. Although it has not diminished the sharpness of the glacial striæ engraved on the hard rocks of the Ullswater islands, it produces marked erosion on the turfy shores of Derwentwater and Windermere, and on the margins of sandy deltas (see Fig. 19). Wave-action, slight though it is, has probably a good deal to do with shaping the gently sloping beach which extends from the water's edge in most instances as a gravelly or mud-covered slope, and then sinks abruptly into the depths of the lake.

The heavier portion of the detritus rolling down the hillside or carried along by flooded streams stops on the flat beach, and it is curious to see long lines of boulders ranged along the water's edge in some lakes as uniformly as if they had been placed by the hand of man. Pebbles and gravel are carried farther out on the slopes; sand and sometimes clay lies beyond them, and, in the centre, the bed of all the larger lakes is carpeted with the softest and finest mud.

On the hillside the agencies of sun, air, and rain all make for increasing diversity of outline, and the contour-lines of the land are twisted into innumerable juts and bends by the action of natural sculpturing. Under the surface of still water there is an abrupt contrast; erosion ceases, and the gentle modelling of the plastic sediment tends to reduce angles and fill up all irregularities of outline. Thus the subaqueous contour-lines flow in freer curves, and, however minutely they are delineated, they have a more generalized form than those on land.

Professor Penck lays great stress on the ratio between the average depth of a lake and its maximum depth as an index of the general form of the basin.* Thus when the average is more than fifty per cent. of the maximum (as in the Lake of Geneva, Buttermere, Crummock, and Wastwater), the form of the basin is that of a chaldron ; if notably less, it is that of a funnel. Strictly speaking, I believe this comparison is only applicable to lakes of substantially the same type.

The object of our survey was to lay down on maps the isobaths or contour-lines of depth, and so to compare the scenery of the subaqueous with that of the subaërial region of the Lake District. I fear that this comparison, however completely it may be made, cannot throw much light on the origin of the lake-basins, for the original hollow, whether it were the result of cracking or crumpling or scooping, must be by this time effectually covered by the blankets of ever-thickening sediment, through which no distinct evidence of primitive form can be felt.

It is essential, in an accurate survey of this sort, to connect the sublacustrine contours with the sea-level altitudes fixed by the Ordnance

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* 'Morphometrie des Bodensees,' *Jahresbericht Geog. Ges. München*, 1894, p. 119.

Survey on land. This must be done at the time when soundings are made, as no records exist, except in the case of Derwentwater, so far as I could ascertain, of the variations of the lake-levels from month to month. Thus it was impossible to utilize the earlier soundings, even in those cases where they were made accurately—as, for instance, by the geological surveyors—to supplement our recent work. We found them of great use in determining the position and direction of our sections, but the soundings themselves were never such as to permit contour-lines of depth to be drawn with any confidence. The earliest record of regular soundings I have found is in a folio volume, entitled 'A Survey of the Lakes of Cumberland, Westmorland, and Lancashire,' by James Clarke, Land Surveyor (London, 1787). Subsequently, Peter Crosthwaite, "Admiral of the Keswick Regattas, and Hydrographer to the Nobility, Gentry," etc., made a series of soundings, which he embodied on rough maps of his own construction and published separately between 1792 and 1810. The late Mr. J. Clifton Ward, while engaged on the geological survey of the district, and his colleagues, Mr. Dakyns, Mr. De Rance, and others, made numerous soundings about fifteen years ago in nearly all of the lakes and tarns. These soundings are recorded on the 6-inch maps of the Geological Survey, only a few of which have been published for the Lake District; but I have had access to the manuscript maps at the Jermyn Street Museum, through the courtesy of the Director-General of the Geological Survey, Sir Archibald Geikie, and the kindness of my friend Mr. W. Topley.* Separate soundings have been taken by various people interested in some of the lakes, especially in Derwentwater, where a knowledge of the depth is important for fishing; and in Thirlmere, where the engineers of the Manchester Waterworks made a survey sufficient to enable them to calculate roughly the volume of the lake. All these, so far as it is useful to do so, will be referred to in the discussion of the separate lakes.

III. METHODS.

All our soundings were made from rowing-boats, which were hired, or lent by their owners. We made an attempt to obtain the use of a steam-launch on Windermere, but several gentlemen who kept launches on the lake and were applied to frankly expressed their entire lack of interest in anything beneath the surface; so, as there were no launches on hire, we found a rowing-boat sufficient for the purpose.

The materials used were simple. A sextant was employed for the angular determination of positions when that was necessary, and an

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* I cannot pass this reference without placing on record the great debt I owe to Mr. Topley, and the profound regret with which geographers, as well as geologists, regard his untimely death.

Abney's level for estimating the water-level with reference to a convenient bench-mark. There were several sounding-lines, all of well-twisted hemp line about three-quarters of an inch in circumference. This had been soaked, stretched, and dried repeatedly, and was finally measured and marked, while wet and under a slight strain, at every fathom. The marks were tufts of coloured worsted twisted through the strands, blue being used, except for the fives, which were white, and the tens, which were red. The latter consisted of a single tuft for 10 fathoms, two for 20, three for 30, and so on. Two 10-fathom lines, two 25-fathom lines, and one of 60 fathoms were taken. The correctness of the marking was frequently verified while the lines were in use, and when stretching or shrinking took place allowance was made in plotting the results of the sounding. The soundings were read in fathoms and feet, and are reduced to feet for convenience in plotting the contours. For work in less than 10 fathoms (60 feet) a lead weight of 3 lbs. was used, and in perfectly still weather the same lead could be used safely to 15 fathoms. We usually employed a 5-lb. lead for all depths over 10 fathoms, and this lead was constructed with a brass tube passing through it, so as to bring up a sample of the bottom. The simple open tube worked very well in clay, and perhaps brought up a sample one time out of five in mud; but it was not to be altogether relied on, and when a sample of the bottom was particularly wanted from a special place, a good deal of time was often lost in obtaining it. In order to prevent the gunwale of the boat from being cut by the line, and to diminish friction in hauling up, a piece of thin sheet-lead was moulded on the side of the boat, usually on the starboard bow. Occasional observations of temperature were made at various depths by means of a Negretti and Zambra deep-sea thermometer mounted in the Scottish frame.

The method of working was to row across the lake, steering a straight course from one point to another, stopping at every tenth, fifteenth, or twentieth stroke of the oars, as the case might be, to take a sounding. The length of the interval was regulated according to the length of the section and the regularity of the arrangement of depth, but at the beginning and end of a section the normal interval was always halved, so as to keep account of the steeper and changing gradients always found near shore. At first the number of soundings to a mile was about fifty-six; but these, being only about 30 yards apart, were found to be unnecessarily close, so that the intervals in our late work were made usually of double the length, twenty-eight soundings to the mile, successive soundings being 63 yards apart. Cross-sections were usually sounded out at intervals of half a mile or less along the lake, and they were connected by diagonal sections, and afterwards crossed by longitudinal sections, the detail being filled in by lines of soundings across the deeper bays.

The shore ends of each section were determined at the time on the 6-inch Ordnance map, the exquisite minuteness of which enabled us to put down our position often within a foot of absolute accuracy. It happened occasionally, however, and that too frequently, that different counties bordered a lake, so that only one coast was shown in detail. Then our positions on the blank coast were fixed by sextant bearings from prominent objects on the opposite side. Occasionally, too, in a long section it was impossible to allow for drift due to a variable wind, and then we anchored the boat about the middle and took sextant bearings, so as to have a fixed point. In addition to this, cross-bearings were always noted when prominent objects came into line; and in lakes where there were several islands, these bearings gave several fixed points in every section, and enabled us to check the intervals measured by the oar-strokes.

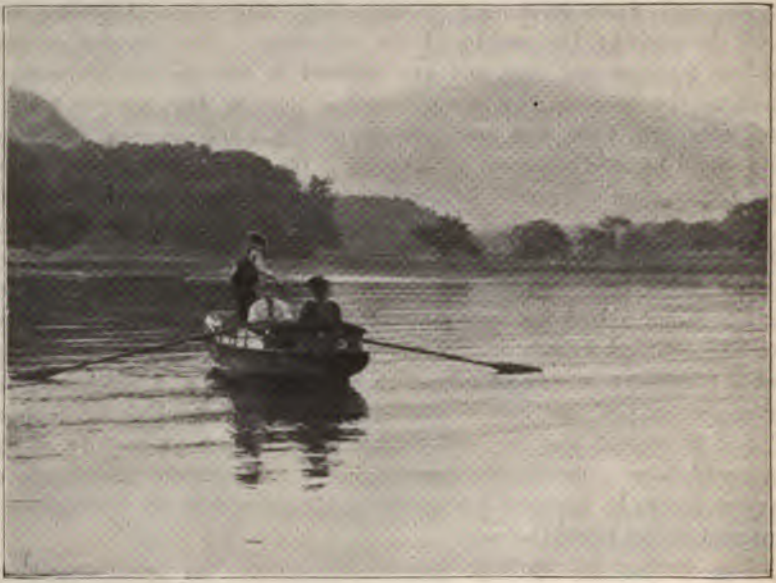

FIG. 3.—METHOD OF SOUNDING.
(*Photograph by Mr. John Thomson.*)

At several points along the shore of some of the lakes very careful measurements of the slope of the lake-bed were made. This was done by landing an assistant with one end of a long marked line, backing the boat out gently in a straight line, and taking a sounding as each fathom-mark of the strained measuring-line passed a given point on the side of the boat.

Each evening the work of the day was plotted on the 6-inch map, the positions and cross-bearings being calculated, and provisional contour-lines were drawn. Next day any doubtful points which arose were settled by additional observations. Ultimately, the whole work was recalculated carefully by Mr. Heawood, and copied on a new set of 6-inch maps, on which contour-lines of each 50 or 25 feet of depth (with the 10-feet line in some places) were shown. From these maps the areas between consecutive contours were calculated in the Ordnance Survey Office at Southampton, and the volume and mean depth were afterwards deduced from the results. The volumes of the lake basins were also calculated at Southampton by a somewhat different method, and the results were, on the average, 2 per cent. greater than mine; the depths of Derwentwater and Bassenthwaite, however, came out as 5 per cent. greater. The mean depth deduced from these calculations was in no case more than 1 foot greater than the figures given in the paper. The divergence probably arose from the Survey working only from the contour-lines, while I made allowance for the shallow rim of beach. Mr. Heawood also made pantograph reductions of the whole set of maps to the scale of 2 inches to a mile, and these, with the detail of the surrounding land added, and the point where each sounding (in the case of Derwentwater and Bassenthwaite, each alternate sounding) was made indicated by a dot, are published with this paper. The lake contour-lines on these maps refer to depth below the actual surface of the lake; but on the 6-inch maps prepared by the Ordnance Survey, the sub-lacustrine contours are calculated from sea-level. Sections were drawn of all the lines of soundings which ran nearly at right angles to the axis of the lakes, both on a true scale, and with sufficient vertical exaggeration to bring the prominent features clearly into view. Longitudinal sections were also drawn on the same scale, as a rule, following the axis of greatest depth. Specimens of these, attached to the maps, are used to illustrate the paper.

The help we received in the work on the different lakes will be acknowledged in each instance. As a rule we did not employ boatmen. When we did, their rowing was often found to vary in strength, and they showed a strong aversion to continue working in rain. On Bassenthwaite, Coniston, Wastwater, Windermere, and the greater part of Ullswater, Haweswater, and Derwentwater Mr. Heawood rowed, and the value of his stroke was found, in plotting the results, to be almost invariable. In these lakes I took almost all the soundings myself, while Mr. Heawood sounded Ennerdale, Buttermere, and Crummock. Mrs. H. R. Mill steered and kept the note-book in most cases of the first group, and we had also the assistance of Mr. A. J. Herbertson on Bassenthwaite and Ullswater, while Mr. Heawood was helped on the second group of lakes by Mr. R. Shields. Sir Charles Wilson and Colonel Farquharson, successive directors of the Ordnance Survey, have most kindly interested themselves in the work. This survey altogether was a piece of pure scientific research, those employed in it giving their time freely, while all expenses incurred for apparatus, hire of boats, and travelling were defrayed by the Royal Geographical Society.

The views of the lakes shown in illustration, only a few of which are reproduced, were mainly from special photographs taken by Mr. Ellison of Perth, an enthusiastic amateur, and Mr. John Thomson, who accompanied us on the Windermere survey, while those of Haweswater were my own, taken with a Frena hand-camera.

IV. Derwentwater.

From the geographical point of view, Derwentwater is unique amongst the English lakes. All the others are comparatively long and narrow; Derwentwater is relatively wide, giving it, when seen from a height, the appearance of a great expanse of water. Unlike the other lakes, it has numerous islands distributed irregularly over the surface, and these islands appear to be flat heaps of rough stones; at least, all of them are surrounded by gently sloping stony beaches. The area of the lake is a little over 2 square miles, and its total drainage area is almost 32 square miles, so that the water-surface is about one-fifteenth of the whole. The lake lies north and south; its extreme length is 2·87 miles, and its average breadth (calculated from its area) 0·72 mile (or 1270 yards), while its extreme breadth is 1·21 mile (2130 yards).

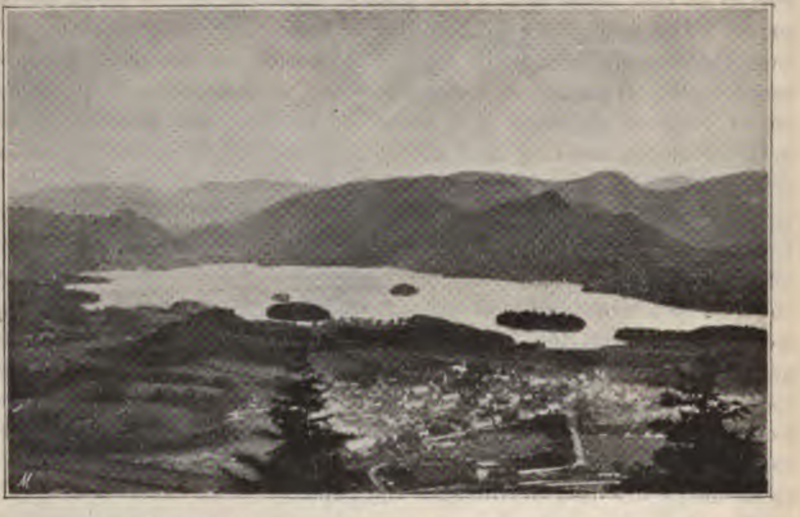

FIG. 4.—GENERAL VIEW OF DERWENTWATER FROM THE NORTH.
(*Photograph by Mr. A. Pettitt, Keswick.*)

The drainage area of the lake consists mainly of Borrowdale on the south, down which the river Derwent flows; the watershed runs very near the banks of the lake on the east and west. Physically, Derwentwater and Bassenthwaite are one lake separated by the low alluvial plain formed by the Greta and Newlands Beck, which extends for 2½ miles between the northern extremity of Derwentwater and the southern extremity of Bassenthwaite (see Fig. 6). This plain is so flat that it is said to be occasionally completely submerged in a heavy flood, when a continuous sheet of water stretches for 10 miles. The contour-line of 300 feet above sea-level cuts the Derwent 1½ mile south of the upper end of Derwentwater, and, diverging gently, runs along both banks of the lake at an average distance of a mile apart from Lodore to Keswick. Here the valleys of the Greta and of Newlands Beck widen the contour-lines to a distance of 1½ mile apart, but they approach to within three-quarters of a mile at the upper end of Bassenthwaite. It is impossible to doubt that the two lakes occupy one depression. The level of Bassenthwaite Lake is about 21 feet below that of Derwentwater, and the plain between slopes northward in its full breadth, presenting none of the features of a valley; for there is practically no slope from the sides toward the central river, but, as the general map shows, the Greta and Newlands Beck flow side by side along it, and the little Pow Beck between the two runs parallel also for the greater part of its course before it swerves to the left and joins the Newlands.

Turning particularly to Derwentwater, we see that the form of the coast-line is largely due to the streams which enter it, as will be shown when describing the configuration of the bed of the lake. The banks on the south-west and the southern part of the west coast are in several cases composed of rock sloping steeply into the water. On the east side cliffs occur at Scarfclose Bay, where the action of waves driven by the prevailing winds against a clay cliff is well shown, and at the promontory of Friars Crag, which is hard rock. Derwent Island, opposite the Keswick boat-landings, and Lord's Island, a little farther south, lie within 200 yards of the shore, and are separated from it by depths of less than 10 feet. This is the case with other small islands, and the only ones which lie near the centre are St. Herbert's Isle and Rampsholme, with the shoal known as the Scarf Stones, south of the latter. All these islands appear to be low heaps of large loose stones covered with soil and vegetation. Round their shores the large blocks of stone may be traced to a considerable depth below the water, and a similar formation is to be seen at most parts of the shore of the lake, except in the few instances where stream deltas cover the stones with shingle or sand, or where rocky cliffs touch the water's edge.

At the time of our visit, June 22 and 23, 1893, the level was lower than had ever previously been recorded. It is an excellent custom at Keswick to insert an inscribed tablet, or cut into the rock at Friar's Crag a record, of every exceptionally low level of the lake, and we found that the record for 1893 was 4½ inches lower than in the famous summer of 1887, which was the lowest up to that date. The record for 1827 was

6 inches higher, and that for 1868 7 inches higher, than for 1893. The level of the surface of the lake is given on the Ordnance Survey maps as 238·3 feet in December, 1862; but levellings made in 1894 showed that the marble slab dated June, 1893, is exactly 244·4 feet above mean sea-level, the former figure being due to a mistake. Mr. John Marshall of Derwent Island has, in continuance of his father's habit, kept a daily record of the height of the lake, and he kindly furnished information on the subject for this paper. The zero for this determination was fixed in 1851 as an ordinary summer low level, and by the new determination it corresponds to an altitude of 245·4 feet. In 1892, the highest record was 6 feet 8 inches above, and the lowest 3½ inches below, the datum, giving a range of practically 7 feet. The greatest height of the water in Mr. Marshall's records was 8 feet 5 inches on November 26, 1861. This would give 9 feet 5 inches as the maximum recorded range. Thus it appears that the average depth of 18 feet would be increased to 27 feet 5 inches by the greatest floods observed; in other words, the lake, when we surveyed it, contained less than two-thirds of the quantity of water it is known to have temporarily held.

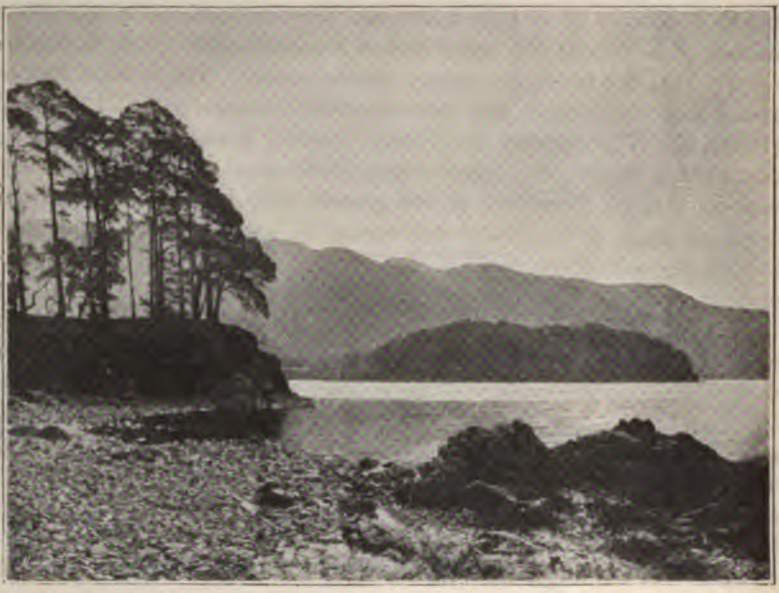

FIG. 5.—FRIAR'S CRAG, DERWENTWATER, JUNE, 1893, SHOWING THE LAKE AT ITS LOWEST RECORDED LEVEL. LORD'S ISLAND IN THE BACKGROUND.

(*Photograph by Mr. W. Ellison.*)

The soundings on Derwentwater were made along 33 distinct sections, the total length of which was 19 miles, and there were altogether 1088 soundings, which gave 57·3 soundings per mile of section, or 527 per square mile of area. These soundings enable us to calculate the volume of water in the lake at the time as 1010 million cubic feet, and the average depth as 18 feet. That is to say, a vertically walled reservoir of the same superficial area as the lake would, if made uniformly 18 feet deep, contain the same quantity of water. The mean depth is only 25 per cent. of the maximum depth, by far the smallest ratio found.

The arrangement of depth, as shown by the contour-lines of 10, 25, and 50 feet on Map II., is the most complex which was met with in any lake. From the head of the lake to a line drawn from Brandlehow Point to Barrow House the depth was under 10 feet. This great flat shallow, measuring roughly one quarter of a square mile, was unapproached for extent in any other lake except Bassenthwaite. The Derwent enters the lake at the apex of a large delta composed of fine shingle and sand, and the Watendlath Beck runs in at the south-east corner in a bay formed by the more rapid sedimentation of the main river. The Barrow Beck farther north has built a large delta, which is a conspicuous feature on the coast-line, while both on it and on the main delta the river entrance is found on the down-lake side. The deepest water lies between Brandlehow and Falcon Crag, depths over 50 feet occurring in two irregular patches separated by a curious tongue of shallow water (under 25 feet), which appears to be a direct prolongation of the Derwent delta. The deepest water of the lake occurs in the eastern depression, almost midway between Scarfstones and Barrow Point; it is only 72 feet. The way in which Barrow Beck has carried sediment into this hollow is beautifully marked by the curving of the 10, 25, and 50 feet contour-lines. The deep water stops at a line drawn from Otterbield Point to the Cat Gill, north of Barrow Point, so that depths over 35 feet are entirely confined to the southern half of the lake, in which there are no islands. The northern half of the lake may be looked on as a nearly flat plain averaging about 14 feet in depth, but grooved from south to north by three furrows running from the deep-water area, and separated from each other by two ridges. These furrows are defined by the 25-feet contour-line, and in each the depth increases slightly but suddenly close to the northern end. The central furrow runs from the end of the central ridge, which divides the deep basin into two parts, and terminates at Friar's Crag. Pennant, in one of his famous tours before 1776, describes this furrow, and ascribes it to the action of the Derwent flowing through the lake. He gave the greatest depth in it as 20 feet, and was not aware of the existence of deeper water to the south. Other early writers speak confidently of depths of 40 fathoms where we found only 4 feet.

The central furrow is separated from the eastern (which terminates at the north point of Scarfclose Bay) by the broad ridge which rises above the surface in Scarf Stones, Rampsholme, and Lord's Island. The western furrow ends off Copperheap Bay so far as the 25-feet line shows, but it is distinctly indicated by the soundings for a quarter of a mile further north. It is separated from the central furrow by a broad ridge, on which St. Herbert's Isle, two shoals previously unmapped, and Derwent Island rise. This curious formation contains much controversial material. The three furrows suggest three river-channels. The central ridge across the deep area can hardly be sediment from the river; it suggests, rather, an eskar. If it had not been for the central furrow, the configuration would closely resemble two lake-basins side by side. It is difficult to select a typical longitudinal section, but No. 5, shown on the map, from the Derwent delta to Derwent Island, shows some of the characteristics of the eastern half of the lake.

Section 1, drawn from west to east across the northern slope, and Section 2, across the southern slope of St. Herbert's Isle, show not only the three main furrows and the two main ridges, but indications of several others. Indeed, it would appear that the whole bed of Derwentwater is scored by grooves and scarred by ridges, all running from south to north parallel to the axis of the lake, and suggesting some forms of glacial accumulation. Section 3 runs through the two great depressions and the ridge dividing them; while Section 4, from Brandlehow Point to Barrow Point, serves to illustrate the steep descent of the rocky shore on the south-west, and remarkably level floor (broken by a heap of stones) which characterizes the southern end of the lake, the southern end of the eastern hollow, and the steep slope of the Barrow delta. The position of each of these sections is shown upon the map by letters corresponding to the terminal points.

The stony character of the islands and of many parts of the lake-shore has been already mentioned. I am inclined to believe that the true floor of the lake is entirely covered with large flat stones, although in the deep water they are covered with the fine dark-brown mud which is always found carpeting the greatest depths of lakes, and on the extensive flats under 12 feet in depth they are covered by a peaty layer composed of a felted mass of the roots and stems of water-plants and soil resulting from their decomposition. No lake, not even Bassenthwaite at equal depths, contained such a wealth of water-plants as Derwentwater. Off the north end of Lord's Island the boat-hook was pushed down through 18 inches of this muddy peat, and struck against stones below, which appeared to be large and flat, similar to those visible on the much steeper slopes of St. Herbert's Isle and Derwent Island and in the Scarf Stones. Near the north-west shore of the lake small patches of stones were seen in depths of from 6 to 8 feet, from which the peaty covering appeared to have been torn away, the remainder lying with sharply cut edges.

The floating island was visible during our stay, exactly in the position which Mr. Symons assigns to it in his book, 'The Floating Island in Derwentwater.' Only a small area of the weed-covered carpet of the lake had risen to the surface like a large blister, and the surface was not solid enough to land on. The water between the floating island and the shore to east and south was in no place more than 3 feet deep, and usually considerably less. Probing the margin of the island, we found that a boat-hook could easily be driven in 5 feet 6 inches without meeting a solid foundation. On its withdrawal it was followed by a rush of gas smelling slightly of sulphuretted hydrogen, but, as the wind was high and rain falling at the time, it was impossible to find whether it would burn. My observation of the island inclines me to believe in Mr. Symons' theory of its formation by the buoying effect of gas entangled in the vegetable felt. I would meet his difficulty as to why the peaty carpet should not be thick enough to form "bobbing islands" in other parts of the lake by the observation that in no other part is the floor of the lake so flat for a large area, and that, in the bay where the floating island lies, the current of the Derwent and the Watendlath Beck probably give rise to an eddy which promotes the accumulation of fine sediment, the aëration of the water, and the healthy growth of water-plants.

Several observations of temperature were made on Derwentwater. On June 22 the surface water was between 67° and 68° Fahr.; on the 23rd, between 67° and 64°, the Derwent bringing in colder water on account of rain; while on the 27th the surface temperature was 63·5°. Temperature soundings were made in the eastern depression on the 22nd and 23rd, and showed that the water was at nearly the same temperature (over 66°) from the surface to a depth of 20 feet, then fell rapidly to 61° at 30 feet, 57° at 50 feet, and 50·3° on the bottom in 70 feet. The arrangement of surface temperature showed the effect of the wind, being warmer on each day along the leeward shores, and colder to windward, where the warm surface layer had been blown away.

Special thanks are due to Dr. Knight of Keswick for his deep interest in the work, and the many forms of help he gave us; and also to Mr. Brooker for the loan of his boat, and for giving us the benefit of his great knowledge of the lake.

V. Bassenthwaite.

The relation between Bassenthwaite and Derwentwater has been already explained, but the lake itself, though perhaps the least interesting from the scenic point of view, presents certain remarkable features in its physical geography. It is exactly the same size as Derwentwater, a little over 2 square miles, but, being 3·83 miles in length, its average breadth is 0·54 mile, or 950 yards, the same as Windermere. The widest part of the lake, near the mouth at the bay below Bassenthwaite Lake Station, is exactly three-quarters of a mile, and almost the same breadth is found in the deeply cut Bowness Bay. The drainage area is the largest of any of the lakes, for Bassenthwaite alone receives contributions from heights lying outside those which have their orographic centre on High Raise. The direct drainage area measures 91½ square miles, or forty-four times the area of the lake. This appears more remarkable when we remember that the drainage areas of all the other lakes are only from twelve to twenty times as great as their water-surface. Adding the areas draining into Derwentwater and Thirlmere, the surplus water of which enters Bassenthwaite, the total catchment area of that lake amounts to 134 square miles; while all the other lakes together, with a water-surface of 15 square miles, have a total of 230 square miles of drainage area. The main tributary of Bassenthwaite is the Derwent, entering at the south-east corner with the over-flow of Derwentwater. It is joined at its outlet from the higher lake by the Greta, flowing from the east, swollen by the Naddle Beck and St. John's Beck (from Thirlmere) on the left, and by the Glenderaterra and Glenderamackin Becks on the right, as well as smaller streams flowing from the south and east of Skiddaw. At the south-west corner of Bassenthwaite the Newlands Beck enters from a valley running parallel to Derwentwater on the west, as Naddle Beck does on the east. The

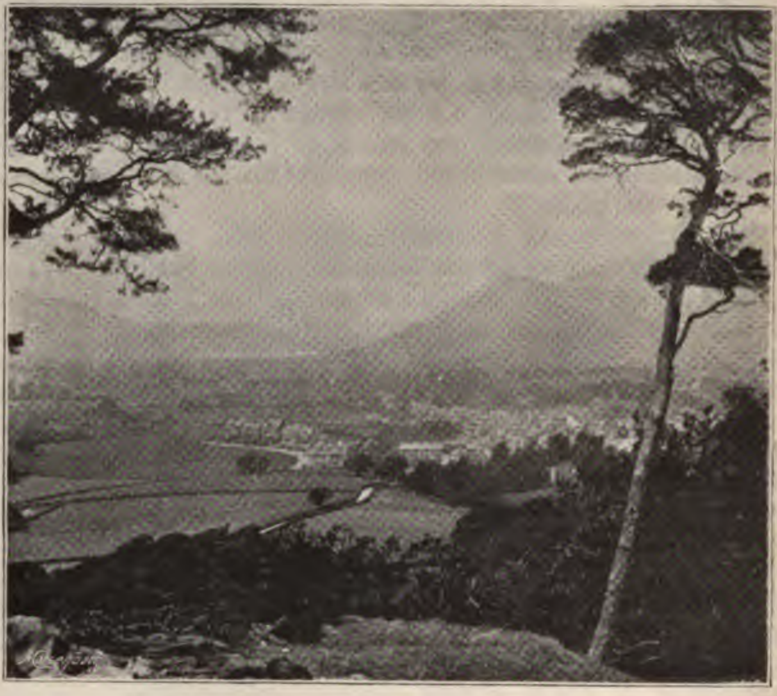

FIG. 6.—DISTANT VIEW OF BASSENTHWAITE LAKE FROM CASTLE HEAD, SHOWING THE ALLUVIAL PLAIN SEPARATING DERWENTWATER AND BASSENTHWAITE, WITH SKIDDAW IN THE BACKGROUND ON THE RIGHT, AND THE TOWN OF KESWICK IN THE FOREGROUND.

(*Photograph by Mr. W. Ellison.*)

western side of Bassenthwaite is very uniform in outline, and bordered by steep wooded slopes rising directly from the lake, whence only two noticeable streams flow: Beck Wythop, which has formed a beautifully rounded deltaic promontory in front of its valley opposite Bowness Wood: and Dubwath Beck, which enters near the railway station at the north end. The eastern coast is much flatter, the steep escarpment of Skiddaw trending northward, while the lake-line runs north-west. The coast-line is broken near the middle by three promontories of low land: Scarness on the north, long and narrow; Broadness, forming a square jut; and Bowness, farther south, of tongue-shape. Sharply curved bays of shallow water run in between these points, but neither promontories nor bays receive any streams larger than drains. North of Scarness, a stream formed by the junction of Dash Beck and Chapel Beck, from the northern slope of Skiddaw, comes in over a well-marked delta of steep slope.

The altitude of the water-surface was determined by the Ordnance Survey as 226 feet on October 3, 1864. No record has been kept of the fluctuations of the lake-level so far as I have been able to ascertain. The breadth of the exposed beaches on the flat shores of Derwentwater and Bassenthwaite was practically equal at the date of sounding, indicating that both lakes had shrunk in the same proportion. Colonel Farquharson, Director of the Ordnance Survey, kindly undertook to have the exact difference of level between the two lakes determined by a special levelling in May, 1895. It was then found that the surface of Bassenthwaite stood at 224 feet, that of Derwentwater at 245 feet, giving a difference of 21 feet, and since Derwentwater at the time of sounding had the level of 244·4 feet, that of Bassenthwaite may safely be taken as 223·4 feet above the sea..

We were engaged in sounding Bassenthwaite on June 24 and 26, 1893, hiring a boat from the landing near Bassenthwaite Lake station. Twenty-five lines of soundings were made of an aggregate length of 13 miles, and containing 735 soundings, *i.e.* 56·5 per mile of section, or 355 per square mile of area. The volume of water, deduced from the contoured map which gave expression to the soundings, was 1023,000,000 cubic feet, about 13,000,000 cubic feet greater than Derwentwater; while the average depth was 18 feet, the same as in the more picturesque lake. The greatest depth found was 70 feet.

The general configuration (see Map III.) was very simple compared with Derwentwater, and the areas at equal depths were different. Bassenthwaite had a much larger extent of water under 10 feet in depth, a smaller proportion between 10 and 25 feet, and a considerably greater amount between 25 and 50 feet, indicating a generally steeper slope. The map shows that the upper end of the lake is very shallow, especially along the east side where the

Derwent flows in, and in all the large bays of the east coast and the large bay on the north-west where the Dubwath Beck enters. Depths over 25 feet are confined to a uniform trough nearly 2 miles long, running down the lake from a point three-quarters of a mile from the head, and stopping abruptly off Scarness Point. The 25-feet line runs along the sides parallel to the 10-feet line, but is closer to it along the west than the east shore, except off Broadness. It clearly shows the prolongation of a shallow bank half the breadth of the lake along the south-eastern side. The deepest water lies in a comma-shaped depression defined by the 50-feet line, the rounded head at the southern end, and the tapering tail keeping close to the 25-feet line along the west coast, showing a steep continuous slope under the steep western shore to the greatest depth, and a much gentler terraced slope from the eastern side. There are indications of a slight groove parallel to the main depression running from the bay east of the entrance of the Derwent close along the south-eastern shore for nearly three-quarters of a mile, but the indications are not very clear, possibly because the lines of soundings were not drawn sufficiently close.

The sections across the lake are much more distinct in their suggestions of a double-troughed depression separated by a broad central rise. No. 2, from Blackstock Point to the opposite shore, crosses the southern end of the great depression, and then the broad plateau to the east. No. 1, half a mile farther north, shows the steep slope from the west side into the main depression, the more gentle rise, central plateau, and distinct hollow on the eastern side, where a sounding of 25 feet was found close to shore. No. 3, from the Beck Wythop delta to Bowness Wood, shows the very abrupt descent from the east side into deep water and the central rise; while No. 4, from Smithy Green to the south point of Scarness Bay through the deepest part, shows the same features reduced in intensity. Section 5 is taken along the axis of maximum depth from the inflowing to the outflowing river.

From these sections I conclude that the general structure of Bassenthwaite presents considerable analogies to that of Derwentwater, of which the most important are its general shallowness and the existence of parallel channels running along the lake.

Two sections to a true scale (Fig. 7) show the slopes of the bank for about 150 feet from shore. The particulars of these sections are given below. They were made by fixing one end of a long marked line on shore, backing the boat out so as to keep this line taut, and taking a sounding at intervals of 6 feet of distance. The Bowness Point observation, No. I. (Ab), was on the east shore of the lake; the Beck Wythop observation, No. II. (Aa), was off the delta of that stream on the west shore. The soundings are given in feet.

Distance from shore	0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126	132	138	144	150	ft.
No. I. depth	0	-	1	1	1	2	—	4	5	5	6	6	6	7	7	7	7	8	10	10	13	17	19	22	—	—	ft.
No. II. depth	0	1	1	1	4	7	9	13	15	16	18	21	23	24	25	27	29	30	31	33	33	36	36	37	39	41	ft.

No. I., the more gradual, averaging 6° down to a depth of 12 feet, is off Bowness Point (Ab, F on map), and the more abrupt off Beck Wythop delta (Aa, E on map), showing the characteristic rapid slope due to the sliding of gravel and stones. Its average slope, beyond the beach 18 feet wide, is 17½°. Except off the growing deltas on the east side, there are indications in the sections of a narrow bench or terrace running round the lake from 8 to 15 feet below the present water-level.

Contemporaneous wave-action was shown in several places along the shingly slopes on the east side in the form of a shallow lagoon, dry at the low level found on our visit, perhaps 3 or 4 inches deep, several feet wide, and 50 feet or more in length, running parallel to the lake, and separated from it by a low ridge of stones and shingle.

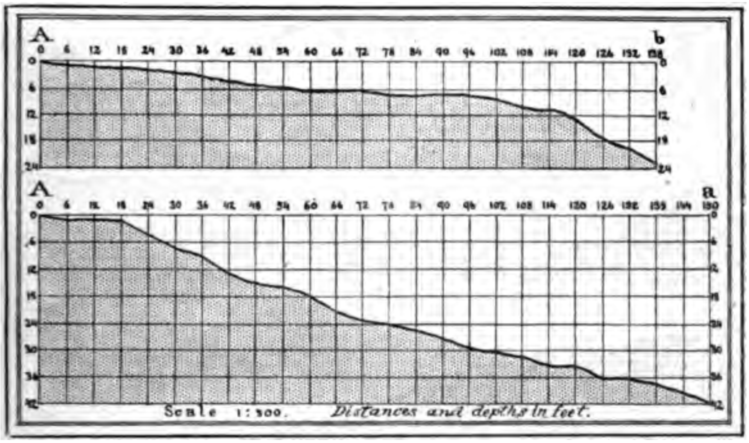

FIG. 7.—SECTIONS OF SLOPE IN BASSENTHWAITE LAKE IN A TRUE PROPORTION.

The steep slopes of the lake above and below water were always composed of smooth rounded stones, much smaller than the great blocks of Derwentwater. The stones were only observed to be covered with mud on the shallow flats at the north-west and southern ends, and, except for some rushes and water-lilies in the south-eastern corner, there were remarkably few water-plants, and no sign of a peaty floor. Well out in the lake the sediment was always found to be soft mud.

The surface temperature on the two days varied from 63° to 64° Fahr., at 15 feet it was 63° in several parts of the lake, and in the centre of the main depression off the middle of Broadness the temperature at 30 feet was 62·2°, and at the bottom (66 feet) 58·3°—considerably higher than at like depths in Derwentwater. This may result from a large part of the inflowing water being derived from the surface layers of Derwentwater, which are very warm in summer.

VI. Buttermere and Crummock.

The double lake of Buttermere and Crummock presents obvious analogies to Bassenthwaite and Derwentwater, but the differences outweigh the resemblances. The lakes lie in a long narrow valley at first directed north-west, then turning sharply to north-north-west. The land contour-lines from 400 feet to 800 feet run close to each other along both sides of the entire valley, presenting a uniformly steep hillside indented by only a few shallow lateral valleys. The hills rise to elevations of over 2000 feet along the eastern edge, where the slope is perhaps a little less steep than on the western, though the summits on the west above Crummock Water are a little lower. The plain separating the two lakes is absolutely flat and lies across the mouth of the lateral valley of the Mill Beck coming from the east. This stream, unlike the Greta, turns abruptly northward to the lower lake without reaching the short river flowing out of Buttermere, which has been pushed over by the alluvium of the Mill Beck close against the base of the steep slope on the east side. This plain is just three-quarters of a mile in length (see Map IV.).

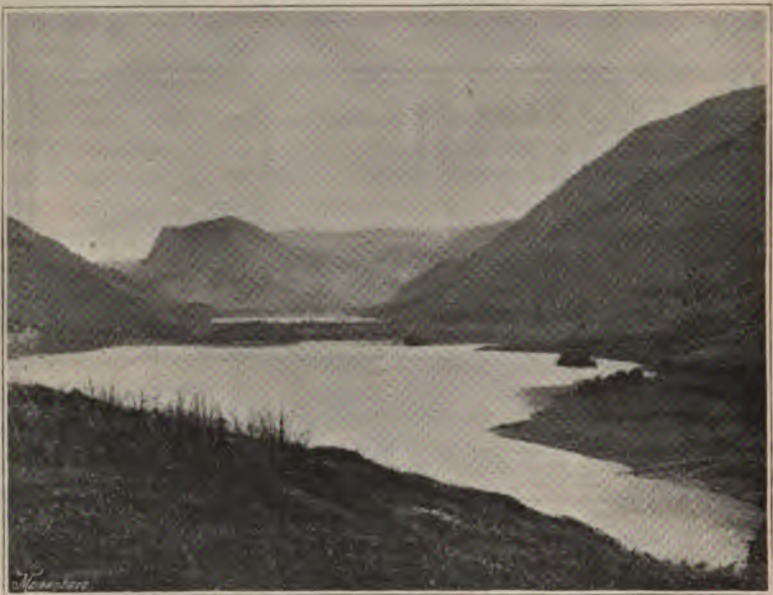

FIG. 8.—VIEW OF BUTTERMERE FROM CRUMMOCK WATER LOOKING NORTH, SHOWING THE FLAT LAND BETWEEN THE LAKES.

(*Photograph by Mr. A. Pettitt, Keswick.*)

Buttermere itself is 1·26 mile in length, and as its area amounts to only 0·36 square mile, its average breadth is 0·35 mile (620 yards), and as the lake is very uniform in outline this breadth is that actually found, the maximum being only 670 yards. Its drainage area is 6½ square miles of mountainous country, mainly to the south, and this is eighteen times greater than the water area. The chief streams are the Warnscale Beck, which enters at the southern corner; and the Gatesgarth Beck, coming in about the middle of the south-east end of the lake, forming a deltaic projection in what would otherwise be a straight coastline. The Hassness How Beck, near the upper end of the lake on the north-eastern side, forms by its delta the only pronounced irregularity of the right shore; and the Comb Beck opposite it on the left side has also formed a little promontory, the lake between the two being constricted in width. Many small becks foam down the hillsides, but the only one it is necessary to mention is Sourmilk Gill, which flows in at the north-western corner, just beside the outlet. The lower end of the lake starts at right angles from the left shore, but it is rounded off on the right by the usual horizontal curve of the up-lake end of a delta.

The surface of the lake stands at an altitude of 331 feet according to the Ordnance Survey, but the date of this determination—probably 1862 or 1863—is not stated.

The lake was sounded on October 31, 1893, by Mr. Heawood and Mr. Shields, who made 10 sections of 3 miles in total length, and 86 soundings, *i.e.* 29 per mile of section, or 3·8 per square mile. Measurement from the contours gives the total volume as 537·5 million cubic feet, and the average depth 54½ feet. The fact that this, the smallest of the true valley lakes (if we except Hayes Water), is on the average three times as deep as Derwentwater or Bassenthwaite, shows clearly how the physical circumstances of the latter differ from those of all their neighbours.

The isobathic lines of Buttermere show that nearly two-thirds of the area of the lake has a depth exceeding 50 feet, and the shallower water is confined to the steep lateral slopes and the somewhat gentler but still steep terminal ramps. The lake, indeed, forms a simple trough with steeply sloping walls and a nearly flat floor. The deepest water, 94 feet, was found less than one-sixth of a mile from the head. The upper ramp, sloping from the floor to the head of the lake, was scarcely less steep than the sides, while the lower ramp sloped much more gently. Fig. 1 shows a section across the deepest part of the trough between the two constricting deltas of Comb Beck and Hassness How Beck. If the bed of the lake were dry, one would find, setting out from the delta of Comb Beck to walk across it, 270 feet of a slope of 1 in 3, leading to 600 feet of perfectly level plain, and that in turn giving place to 200 feet of a slope somewhat steeper than 1 in 3. The slope to the bottom of the trough is always steeper along the front of a delta, and in one place it amounts to 1 in 2 as an average from the surface to the bottom. This is about the average slope of the lower part of the hillsides round the lake, but it must be remembered that under water it occurs only off the edge of the flat meadow-like alluvial fans. The absolute flatness of the lake floor has no natural equivalent in sub-aërial scenery; a bowling-green, or, better, a brick-dust tennis-court, is the nearest analogue. In Buttermere, for example, there is a nearly rectangular plain, measuring 400 yards by 200 yards, the undulations on which nowhere exceed 4 feet, and that not in abrupt steps, but as a nearly uniform slope from one end to the other, the gradient being about 1 in 300.

Crummock Water is considerably larger than Buttermere, having an area of 0·97 square mile; a length of 2½ miles, measured approximately along the axis; and consequently a mean breadth of 0·39 mile, or nearly 700 yards. Its whole drainage area is 17 square miles, or seventeen times the area of the water, but, including the Buttermere drainage, it is 22 square miles, almost equal to that of Coniston Water. The lake is slightly curved, the upper half-mile being continuous in direction with Buttermere, while the lower part runs more nearly north-north-west. At the curve the lake narrows to 500 yards between the rocky peninsula of Low Lingcrag and the cliff-bound Hause Point, but from here it continues to widen very gradually for a mile, when its breadth becomes 1000 yards. Thence it narrows slightly for a quarter of a mile, where the south end of the great Park Beck delta, abruptly projecting from the left shore, halves the breadth, and the lake tapers to a narrow outlet.

The main tributary is the river from Buttermere, which flows in at the south-western corner, and the Mill Beck runs in at the south-eastern angle. Three little islets lie near the shore at the head of the lake, but there are no islands of importance. Rannerdale Beck is the only important stream flowing in on the right shore; on the left shore, Scale Beck, on which there is a "force," or waterfall, visited by tourists, enters in two arms over an extensive delta near the head of the lake, while Park Beck carries in the drainage of Lowes Water close to the exit, entering at present over a small parasitic delta jutting from the side of the extensive alluvial plain. The altitude of the lake is about 321 feet.

Crummock Water was surveyed on October 30 and 31, 1893, when 18 sections were made of a total length of 7 miles, and including 166 soundings. These were about 24 to the lineal mile of section, or 171 to the square mile, the great simplicity of the structure of this basin making a comparatively small number of soundings sufficient to define it. From the contours the volume of contained water was calculated as 2,343,000,000 cubic feet, which gives an average depth of 87½ feet.

The lake consists of one great flat-bottomed trough with steep sides, the right or eastern lateral slope down to the depth of 100 feet having an average gradient of about 1 in 3, while the left or western slope averaged only about 1 in 5. Section 1, from Low Lingcrag to Hause Point, includes the two steepest lateral slopes of the lake, if not the steepest subaqueous slopes in the Lake District. At Hause Point, on the right, the cliff ran sheer down, 70 feet being found 8 feet off the rock, and the whole slope averaged 1 in 1, or an angle of 45°; while that on the opposite side was scarcely less, if we reckon from the depth of 25 feet instead of from the actual shore. Here in a total breadth of 500 yards there is a plain 300 yards wide with no diversities of level exceeding 5 feet, and averaging 130 feet below the surface. The slope of the sides at these points is as steep as any of the precipitous mountain cliffs which surround the lakes. Section 2 gives a view of the normal gradient of the lateral slopes about half a mile farther down the lake than Section 1, and passing through the deepest water found, 144 feet. More than half the area of the lake is covered by water exceeding 100 feet in depth, and 208 acres lie below 125 feet, forming a plain 1½ mile in length, the lowest part of which is only 19 feet deeper. The form is well brought out in the longitudinal section. From this flat plain the sides rise steeply—in some places they would be almost unclimbable if in the air—on both sides, at slopes averaging from 1 in 4 to 1 in 3, while at the head the ramp slopes gently up at

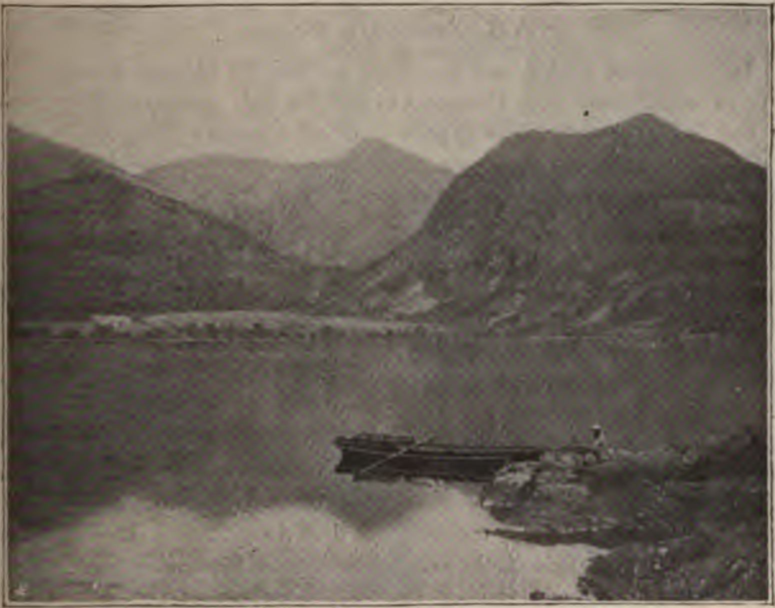

FIG. 9.—CRUMMOCK WATER, RANNERDALE, SHOWING DELTAIC FLAT FILLING A FORMER BAY. HAUSE POINT ON THE RIGHT.

(*Photograph by Mr. A. Pettitt, Keswick.*)

the gradient of 1 in 10, and at the mouth at the gentler gradient of 1 in 15.

This pair of basins, really one trough with the middle filled up (see the longitudinal section through both on Map IV.), shows almost all the typical characteristics of true alpine lakes. One interesting fact is that the ratio of the average to the maximum depth (61 per cent. for Crummock Water, 58 per cent. for Buttermere) is greater than for any other English lakes, or than the lakes of Geneva (50 per cent.), Garda, Como, Constance, Zürich, or Chiem (39 per cent. to 31 per cent.). They have thus, following Penck's morphometrical expression, an exceptionally pronounced chaldron structure.

VII. Ennerdale Water.

In Ennerdale Water (see Map IV.) we find the extreme example of a type of lake hinted at in Crummock, and the only pronounced specimen in the Lake District. The type is that of a narrow deep alpine lake, widening and growing shallower towards its outlet. It may be looked on as a transition between the shallow and deep types. Loch Lomond is the best example of this form in Great Britain, and the Lake of Garda on the continent of Europe. The area of Ennerdale Water is 1·12 square mile, and it is fed by a drainage area of 17 square miles, fifteen times the extent of the water surface. The length of the lake, the axis of which is straight and is directed to the west-north-west, is 2·4 miles, and its average breadth 0·46 mile, or 800 yards. The lake-shores are singularly unindented. For 1½ mile from its square-cut upper end the two coasts run parallel, giving the lake a nearly uniform breadth of 650 yards; then the right bank swerves to the right, and the left bank swerves to the left, giving to the lower end of the lake a nearly semicircular form, the straight left bank being the diameter, and the radius of this circle, corresponding to the maximum breadth, is 1000 yards. A small island lies in the middle of the lake, off the sudden curve of the left shore.

The valley of Ennerdale is exceptionally straight and of uniform slope, the land contour-lines up to 1250 feet running straight and parallel to the lake-shore along its whole length. The slopes of the hills along the north shore are slightly less steep, and in the east are cleft by a large gorge, from which the Smithy Beck descends to the north-east end of the lake, entering it near the place where the River Liza flows in from its long straight valley. The inflections in the lake-shore are defined by two precipitous crags—Bowness Knoll on the north, and Angler's Crag on the south.

The elevation of the lake is given on the Ordnance Survey maps as 369 feet; in 1864 it was fixed as 363 feet, and in June, 1894, as 367 feet. It may be taken as nearly 368 feet at the time of observation.

Mr. Heawood and Mr. Shields sounded it on October 25 and 26, 1893, in unfavourable weather; but they succeeded in making 20 sections of a total length of 8¼ miles, and including 218 soundings. The soundings were thus about 26 to the mile of section, or 194 to the square mile. The volume of the lake was found to be 1,978,000,000 cubic feet, somewhat less than Crummock, and the mean depth appeared to be 62 feet.

The lower half-mile of the lake, including most of the semicircular portion, was a shallow flat, averaging about 18 feet in depth, and the island was connected to the right shore by depths under 25 feet, that contour-line running only a small distance further down the lake. The upper part of the lake was entirely different, forming a single deep trough with steeply sloping sides and flat floor. The average steepness from the shore to a depth of 100 feet was 1 in 3 along the left or southern side, and 1 in 4 along the right or northern shore. The steepest gradients found were a little steeper than 1 in 2 from the shore to 125 feet at Angler's Crag, and 1 in 1·2 from the depth of 25 feet to 100 feet on the slope of the delta off the mouth of the main river as it enters. An indication is shown by the 25-foot contour-line of a former entrance of the river considerably to the south of the present one. The central plain is 1¼ mile long, and in places 500 yards wide at depths below 125 feet, the greatest depth on the plain being 148 feet near Angler's Crag. There are 163 acres below 125 feet.

Sections 1 and 2 are typical sections across the shallow lower end and the middle of the deep trough. The longitudinal section follows the axis of maximum depth in the deep part, but strikes straight across the shallow lower end.

In the case of this lake again, we find that the subaqueous slopes are quite comparable with those of the free hillside for steepness.

(*To be continued.*)

LIFE OF SIR SAMUEL BAKER.*—REVIEW.

By E. G. RAVENSTEIN.

SIR SAMUEL BAKER has deserved well of geographers. A man of wide sympathies and varied activities, bold as a hunter, persevering as the founder of a European settlement in a tropical country, ardent in his patriotism, it is yet as a geographical explorer that Baker's name has enjoyed, and will enjoy among posterity, the greatest admiration, and it is as an explorer and geographer alone that we have to deal with him in these pages.

When Baker first turned his attention to African exploration, he was already a man of forty years of age, for he was born in 1821, and it was only in 1861 that he "determined to commence an expedition to discover the sources of the Nile, with the hope of meeting the East African expedition under Captains Speke and Grant somewhere about the Victoria Lake." The authors, on entering upon the subject of the Nile, introduce a sketch of previous Nilotic exploration, with reference to which it may be stated that, long before the days of Delisle and D'Anville, a few geographers had recognized the fact that the lakes and intricate rivers occupying on our maps the whole of Southern Africa were mere figments of imagination, or the doubles of Abyssinian lakes; that it was Michael Hey, the companion of Rüppell, who first among Europeans sailed up the Bahr el Abiad; and that Petherick never reached the low latitude claimed by him. Miani, too, who cut his name in a tree (33° 35′ N.), subsequently discovered by Speke, might have been mentioned.

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* 'Sir Samuel Baker:' A Memoir by T. Douglas Murray and A. Silva White. Maps and Portraits. Macmillan & Co.

When Baker entered upon the path of an African explorer, the opportunities for gaining distinction by making discoveries of importance, such as would strike the imagination of the public, and effect changes in our maps visible even to the least observant of observers, were much greater than they are now. As Speke was not expected to reach the Upper Nile before the beginning of 1863, Baker spent the interval allowed him in making an experimental trip, which would serve him as a training, and make him thoroughly acquainted with the language and character of the people, upon whom his success in future would be mainly dependent. He acquired, too, the use of astronomical instruments, which enabled him subsequently to lay down his routes with satisfactory accuracy. In this he acted wisely. He chose for the field of his experience the wide steppe region which extends from Berber and Khartum, across the Atbara, and to the foot of the Abyssinian highlands, which possessed in his eyes the additional advantage of being a very sportsman's paradise. On this occasion, as well as subsequently, he was accompanied by his heroic wife, whose benign influence can be traced in many a passage of Baker's books of travels.

On December 18, 1862, Baker left Khartum for the Upper Nile, not by any means attended by the good wishes of the people, nor even of the Egyptian officials, who not unnaturally looked upon this intruder as one likely to interfere with the slave-trade, which was yielding them large profits. It is well known that Baker met Speke and Grant at Gondokoro on February 15, 1863, anticipating Petherick's relief expedition by five days.

While the successful "settlers of the Head of the Nile" sailed away in Baker's boats to Khartum, Baker himself started in quest of a reported lake, which constitutes an important feature in the Nilotic system, although reported to be much smaller than the Victoria Nyanza. By a circuitous route, which led through the country of the Latuka, an interesting tribe whose language is akin to that of the Masai, surmounting the obstacles placed in his way by the leaders of slave-caravans, and breaking the mutinous spirit of his own men, Baker at length reached the Somerset Nile near the Karuma falls. Crossing Unyoro, he looked down upon the sought-for lake, weary and toil-worn, but sustained by the quenchless enthusiasm that had carried them to the goal of their ambition. This was on March 14, 1864, in lat. 1° 14′ S. The authors very fully discuss the geographical results of this important journey, not inappropriately referred to as the "crowning achievement" of Baker's life. And here, once more, it is proved that we cannot always trust the evidence of our own eyes. Baker, who stood close to the southern extremity of the lake, conceived that it extended for 200 miles to the southward, or to about 1° S. lat. And Baker obstinately adhered to his view, even after Colonel Mason had made a survey of the lake; and as recently as 1878 he wrote to Mr. H. M. Stanley that the "Beatrice gulf [now merged in Albert Edward Nyanza] is, of course, a portion of the Albert." Thus do we cling to the delusions of our youth!

After a prolonged stay in England (1865–69), in the course of which Baker's services to geography were fully recognized, he accepted the lead of an expedition expressly fitted out for the suppression of the slave-hunters, and the establishment of legitimate commerce in the regions of the Upper Nile. The work attempted by Baker during these four years of hardship is ably set forth under the appropriate heading of "The Task of Sisyphus." Baker himself recognized the fact that he had not gone the right way to work, in order to effect any permanent results. "Measures of forcible repression were all very well for punitive or police purposes, but they did not strike at the root of the mischief; they simply lopped off vicious excrescences, and left the main supports untouched." These errors of judgment, however, might have been repaired by Baker himself, or his successors, had he enjoyed the support of a strong Government, really in earnest. Baker, at all events, had driven off the slave-hunters, and "had planted in the countries annexed to Egypt the rudimentary structure of an administration, which had for its object the creation of law and order, of legitimate commerce, and of havens of refuge against slave-hunters."

The authors must be congratulated upon the impartial manner in which they have sought to perform the task of writing the life of a deservedly popular Englishman. They have given us more than a mere biography, for they have enabled us to form a true estimate of their hero by showing us the environment which impelled his thoughts and actions. Their book is, indeed, one which persons interested in the true welfare of Africa will do well to study. Perhaps, too, it may again direct attention to Baker's great works of African travel—'The Nile Tributaries of Abyssinia,' 'The Albert Nyanza,' and 'Ismailia.'

THE MONTHLY RECORD.

THE SOCIETY.

The International Geographical Congress. — The Sixth International Geographical Congress will be opened on the evening of Friday, July 26, by H.R.H. the Duke of York, in the Great Hall of the Imperial Institute. Up till that day the head-quarters of the Congress and the office for issuing tickets will remain in the house of the Royal Geographical Society, 1, Savile Row. The preliminary programme for the Congress provides for a general meeting of all the members each morning, when papers of general interest will be read and discussed. In the afternoon the Congress will as a rule meet in two sections, the subjects to be considered in each being so selected as to attract different groups of specialists. Subjoined is a skeleton programme which, when filled up, will probably form a fair forecast of the arrangements for the meeting. A detailed programme will be ready before the opening day, and a special *Journal* will be issued every morning during the meeting, giving full particulars of the work for the day, and a concise report of the previous day's proceedings. The provisional programme is as follows:—

Friday, July 26.—The Congress will be opened in the Great Hall of the Imperial Institute at 9 p.m., when short addresses of welcome will be delivered by H.R.H. the Duke of York, Honorary President, and by Mr. Clements R. Markham, President. A Conversazione in the rooms and gardens of the Imperial Institute will follow. *Saturday, July* 27.—Mr. Markham will deliver his Inaugural Address in the Great Hall at 10 a.m., after which the Congress will meet in two sections to discuss papers on "Geographical Education," by Professors Levasseur and Lehmann and others, and on "Mathematical Geography," especially the use of photography in surveying, by Colonel Laussedat, Colonel Tanner, and others. *Monday, July* 29.—A general meeting of the Congress will discuss the subject of "Arctic and Antarctic Exploration," introduced by Professor Neumayer and Admiral A. H. Markham. In the afternoon two sections will be formed, in one of which questions in "Geodesy" will be treated by General Walker and M. Lallemand, while in the other, papers will be read, amongst others, by Prince Roland Bonaparte on "Glaciers," and M. Martel on "Spelæology." *Tuesday, July* 30.—Report of Committees and papers on the proposed "Map of the World" on the scale of 1:1,000,000, and on "International Geographical Bibliography," will be presented at the General Meeting, and two sections will then deal with "Oceanography," introduced by Mr. J. Y. Buchanan, and with the "Orthography of Place-names," introduced by Mr. G. G. Chisholm and Dr. Burgess. *Wednesday, July* 31.—Sir John Kirk will initiate a discussion on "Europeans in Africa" in the General Meeting; and in the afternoon the sections will consider "Applied Geography" (Commercial Geography) and "Limnology," the latter to be introduced by Professor Forel. *Thursday, August* 1.—The General Meeting will deal with the "Terminology of Land Forms," and in the afternoon "Cartography" and other subjects will be treated. *Friday, August* 2.—The forenoon will be devoted to papers by Baron Nordenskiöld, Professor Hermann Wagner, and others, on the "History of Maps;" and all the remaining papers will be taken in the afternoon. *Saturday, August* 3.—The votes proposed for consideration will probably be discussed, the date and place of meeting of the next Congress considered, and the President will deliver his concluding address.

Delegates to the Congress have been appointed by the governments of more than twenty countries and colonies, and by more than sixty geographical and scientific societies in all parts of the world. Early applications for tickets should be made. Full particulars of the receptions and other entertainments which have been arranged may be obtained at the Office of the Congress, 1, Savile Row.

Geography at Owens College.—The following report from Mr. A. J. Herbertson, Lecturer in Geography at Owens College, Manchester, has been received too late to find a place along with the reports from Oxford and Cambridge. During the past year the following courses of lectures were delivered at Owens College, Manchester, by the Lecturer in Geography:—A course on *Cartography* during the Michaelmas Term, and one on the *General Geography of Europe* during the Easter Term. An attempt was made to do some practical field-work in connection with the cartography lectures; but the students, who numbered twenty, were all in the Training College, and had no time for more than one demonstration. It is, perhaps, desirable to point out how that the present regulations for Training College students compel those who have not exhibited special merit in geography in the Queen's Scholarship examination to take this subject; and they allow the distinguished students, who, presumably, have been most interested in the subject, and are best qualified to profit by University lectures, to set it aside, which they usually do, as the subject is not recognized by the University as an optional one for any degree. An evening course on the *Principles of Commercial Geography* was announced for the Michaelmas Term, but the necessary number of students did not enroll. The Manchester Geographical Society have kindly offered their room for the evening classes next winter, and the College authorities have agreed that these classes should be held there, in a more central position, where no deterrent restrictions need be applied. The geographical materials at the Owens College are very scanty; but a grant of £20, voted to the Geographical Department by the College, has been spent in buying a few of the absolutely necessary standard books and maps. In conclusion, the lecturer would thank the College authorities and the Manchester Geographical Society for the way in which they have aided him in carrying on his work.

The Society's Conversazione.—On the evening of the Anniversary of the Society, May 27, the President and Council received the Fellows of the Society and their friends at a Conversazione in the Princes Hall and the rooms of the Society of Painters in Water Colours. The guests were received by Mr. and Mrs. Markham. There was an exhibition of Franklin pictures and relics, of some of the paintings made by Mr. Stokes while with Lieutenant Peary, of maps, photographs, and other objects. About 1300 of the Fellows and their friends availed themselves of the invitation.

EUROPE.

The Earthquake at Laibach.—The great earthquake on the night of April 14 to 15, which extended over the greater part of Austria-Hungary, was felt in its fullest intensity at Laibach, the capital of Carniola, a flourishing town of some 30,000 inhabitants. The earthquake began at 11.20 p.m. with three severe shocks following one another at intervals of about half a second, and lasting altogether fifteen seconds. Twenty-five more or less violent disturbances occurred before seven o'clock next morning, and during the following day the intensity greatly diminished, although up to the present (beginning of May) occasional vibrations are still perceptible. Many people suffered severely in the sudden nocturnal flight from the town, but there were, fortunately, few fatal accidents. Nine-tenths of the buildings in Laibach have suffered—two-tenths to such an extent as to require rebuilding; and the total damage is estimated at four millions of florins. The region of greatest intensity of disturbance is apparently not represented by a circular or elliptical tract, as would be the case if the shocks had originated from a central point. One is rather led to assume the existence of several *lines of impact*, as destructive effects were experienced at Trieste, at Goritz, at Villach in Carinthia, at Cilli in Lower Styria, in Croatia, and at Fiume, while the grotto of Adelsberg and the mercury mines of Idria, situated between some of these points, escaped. Further, shocks were experienced almost simultaneously in widely separated districts. Beyond the more intense area, less violent shocks were felt at Vienna, in Upper Austria, at Salzburg, in Eastern and Southern Tyrol, the north of Italy as far as Pavia, beyond the Appennines to Florence, and south to Macerata beyond Ancona; and on the other side of the Adriatic, in the south-western part of Hungary, in Croatia, Bosnia, and Dalmatia. The area of perceptible shocks was, therefore, at least 58,000 square miles, equal to that of England and Wales. At Grenoble, a seismometer gave distinct records of vibrations at about the same time. Professor Hoernes, of Gratz, and Drs. Suess and Toula agree in regarding the Laibach earthquake as one of the so-called "tectonic" disturbances common in areas of subsidence and in mountain ranges, caused chiefly by vertical or horizontal dislocation of the subsiding rocks; and it is remarkable that a certain church standing on a hilltop is now visible from at least one point where the view was formerly blocked by the intervening country, a rough calculation by Professor Penck showing that vertical displacements amounting to over 30 feet must have occurred. It is as yet uncertain whether the Laibach earthquake is connected with the recent inroads of the Adriatic, or occurred along the dislocation line of the Save valley like the Agram earthquake of 1880. Dr. Franz Suess, who has been ordered by government to report upon the earthquake, says that from a preliminary examination it appears that the chief movement was transverse, in a north-westerly direction, with a considerable vertical component. More detailed information may be looked for shortly.

ASIA.

Progress of Dr. Sven Hedin in Central Asia.—In a letter to M. Petrovsky, dated "Saïlik, March 5, 1895," which has been kindly forwarded for our perusal by General Venukoff, Dr. Sven Hedin gives some account of his proceedings in Central Asia in the early part of the current year. On February 24 he had made an excursion to the Yarkand-daria, which he describes as an imposing stream even in the dry season, flowing at the spot visited in a single bed, having then a width of 200 feet, with a maximum depth of 6. There was no ice in it at the time, though some had been seen at no great distance on the road to Maralbashi. The stream is generally wide and divided into several arms, and, according to all accounts, must attain a vast size in the month of June. The passage is effected at various points by means of large boats. On the 25th a start was made with two men for Terem, a large settlement which, with the village Mogal in the vicinity, is said to number four hundred houses. It has a bazaar and three Chinese officials. There is but a narrow fringe of vegetation along the Yarkand-daria, the rest of the country being arid. Further on to the south-west is a marshy country with the saline lake Bai-shan-kul, fed from Yangi-hissar. The sand becomes more continuous, but is not of the kind known as *zor-kum* until close to Urdan-Padishah. Here there were some *imams* and other religious persons, and fifty pilgrims from the villages to the north were met with. The offerings of the pilgrims are thrown into a large *kasan*, the gift of Urdan-Padishah, and go to support the religious employés. The village will soon be buried by a moving sandhill, which has already swallowed up several houses. The *masar* proper is at a little distance from the village. The position assigned to the place on our maps, due probably to Bellew, is not nearly far enough to the south-west, though his description seems accurate. On the 27th Dr. Hedin proceeded northwards to Atjik, a considerable settlement in a marshy neighbourhood on the road to Shan-arik and Kashgar. Returning thence to Terem, he proceeded through an excessively barren country to Terek-lenguer, and thence back to Lailik along the course of the Yarkand-daria. During this trip no archæological remains were discovered, but rather those relating to the hydrography. The Yarkand-daria is shifting its course eastwards, for between Terem and Urdan-Padishah, and between Terem and Terek-lenguer there are several ancient channels. There are, besides, numberless swamps along the left bank, where the water still remains in the ancient beds. Between Lailik and the river there is alluvium, but none on the other bank, while at Terek-lenguer the inhabitants reported that the cultivated ground was gaining in extent. Other old channels and former streams are also spoken of north and north-west of Terem. While resting at Lailik, the traveller was unfortunately prevented from taking astronomical observations by the immense amount of dust in the atmosphere. One of his men had effected satisfactory purchases of necessaries for the journey at Yarkand, and only camels were wanting for the passage of the *Takla-makan*. The intended route was to lead east-north-east to the Mazar-tag, along which Dr. Hedin proposed to proceed to the Khotan-daria. Water and provisions for twenty-five days would be taken; but vegetation and water would probably be found *en route*, especially near the Mazar-tag. In a postscript dated "Merket (opposite to Lailik), March 18," Dr. Hedin refers to the ruins scattered over the country, which are said to occur almost all the way from Maralbashi to Ush-Turfan. He had been unwilling to delay for their examination, for fear of missing the proper season for the passage of the desert, but had determined to visit them on his return. Ruins were said to have been discovered by chance, some years ago, not far from Lailik; but the offer of a reward failed to elicit information as to their locality, and the traveller was beginning to think that the chief of the ruins existed only in the imagination of the inhabitants. At the time of writing he had succeeded in purchasing eight camels; but his servant was about to leave him just when the difficulties were beginning.*

Indian Marine Surveys, 1894–95.—During the recently concluded working season an important coast survey in the extreme north-west of India has been carried out by the Royal Indian Marine ship *Investigator*, which, with her tender the *Nancowry*, returned to Bombay on May 6. It was in October last year that the vessels had left Bombay for Kurrachee, and carried on work south-eastward along the delta of the Indus as far as the principal or Hajamro mouth of the river. The last survey of the coast was made in 1850, and, as is well known, the soundings undergo such great changes owing to the influence of the river that an accurate chart will be much appreciated by navigators. Both the vessels were in Kurrachee harbour in November last when the Viceroy visited the port, and his Excellency was shown all the latest improvements in the machinery and apparatus for obtaining deep-sea soundings and trawling for deep-sea *fauna*, as well as the charts plotted by the officers of the *Investigator*. The two vessels, after spending Christmas at Kurrachee, then proceeded to Palk Strait to examine anew that old problem, the feasibility of a ship channel for large craft between India and Ceylon. The result coincided in the main with that of previous examinations, *i.e.* that no greater depth than 5½ fathoms could be relied upon, a depth which shipmasters would probably consider too risky, even with the prospect of saving from 200 to 300 miles in route. It is curious to read, in one of the Indian papers, that the officers of the *Investigator*, who, when visiting remote localities, are often at some difficulty to obtain fresh provisions, were refused permission by the authorities of the Indian district at Point Calimere to land or shoot in the neighbourhood, though they were granted every assistance by the Ceylon government officials on the other side of the strait. In the domain of natural history, a large harvest of specimens has been obtained by the scientific staff of the *Investigator*, and deposited in the Calcutta museum.

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* An interesting account has been received at the Society from Dr. Sven Hedin of his ascent of the Mustagh-Ata, which has to be held over owing to pressure on the space of the *Journal*.

Indian Railways.—The "Administration Report on the Railways in India for 1893–94," by Lieut.-Colonel W. S. S. Bisset, C.I.E., R.E. (Parliamentary Blue Book, C. 7453, 1884), gives important information as usual regarding the progress of railway enterprise in India. The total mileage open on March 31, 1894, was 18,500, of which 451¾ miles were opened during the year under review, among the more important of these works being the first section of the East Coast (State) Railway, from Bezvada to the south bank of the Godavari, which is now being worked by State agency along with the Rajahmundry-Vizianagram section and the Coconada and Vizagapatam branches, which were completed and opened for public traffic on August 21, 1893. The standard-gauge line from Lucknow to Rae Bareli, a distance of 48¼ miles, was also opened for public traffic. Automatic vacuum brakes were brought into use on the mail trains of the East Indian Railway, and an accelerated mail service was introduced. Pintsch's system of lighting carriages with gas was also adopted on the mail train, while the same system was sanctioned for the Great Indian Peninsula, the Bombay, the Baroda and Central India, and the Madras railways, and its introduction on State lines was decided on. The total capital expenditure on all railways up to December 31, 1893, amounted to 240.90 crores of rupees, of which 181.52 crores related to the standard gauge. The average cost per mile of railway open was 160,971 rupees for the standard gauge, and 70,584 rupees for the metre gauge. There was a substantial increase of 85 lakhs in the gross earnings of 1893, as compared with the figures of 1892, and of 41 lakhs on the net earnings, while the statistical return on the capital expenditure on open lines, including steamboat service and suspense accounts, was, for the year 1893, 5·46 per cent. as compared with 5·42 for the year 1892, a result which contrasts very favourably with the figures furnished by the experience of most other countries.

AFRICA.

The District of Dar-al-Baida, Morocco.—Some interesting notes regarding the present commercial condition of the district of Dar-al-Baida are given in a recent Consular Report (Foreign Office, 1894, Annual Series, No. 1473). The Report deals separately with the ports of Dar-al-Baida, Mazagan, Saffi, and

Mogador. Mogador is of great importance commercially, being the principal seaport for the southern trade of Morocco. For a distance of some 200 miles inland the tribes of Berbers and nomad Arabs are mainly dependent on Mogador for their supplies of such commodities as calico, manufactured and bar iron, sugar, coffee, spices, and green tea, while the almonds of the Atlas and Sus, the wool of Wadnun, and the gums and ostrich-feathers of the Moorish Sudan are brought here for shipment. A considerable trade is still carried on with the city of Morocco, about 120 miles nearly due east of Mogador. The district is chiefly interesting as a tree-growing and pasture country. It is especially suitable for goat and, to some extent, sheep farming. Extensive pasture and arable lands stretch from Mogador eastward to Morocco city, and in a southerly and south-easterly direction to the spurs of the Atlas, capable of producing in normal years abundant crops of cereals. Owing to the uncertain rainfall, the smallest stream is of the utmost importance for irrigation purposes. The privilege of irrigation is in some districts, notably in Sus, purchased at very high prices. The great superiority of river over any other plantations is especially pointed out. On the flats frequently formed by the overflowing of rivers, as in many parts of the Sheshowa, Mafis, Assifelmal, and other tributaries of the Tensift, are found the finest plantations of olive, almond, date-palm, orange, fig, and other fruit trees of especial value to Southern Morocco.

POLAR REGIONS.

The Relief of Lieutenant Peary.—The sealing steamer *Kite*, of St. John's, Newfoundland, has been chartered to proceed to Inglefield Gulf, North Greenland, to bring back Lieutenant Peary. The *Kite* sailed from St. John's on June 22, direct for Inglefield Gulf.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Hydrography of the Sea of Marmora.—In continuation of the work of the *Pola* in the eastern Mediterranean and the Ægean Sea, Dr. Konrad Natterer made some deep soundings in the Sea of Marmora on board S.M.S. *Taunus* during May, 1894, and the results will shortly be published by the Vienna Academy of Sciences. It appears that the usual assumption, based on a knowledge of the prevailing currents, to the effect that the surface layers of water in the Sea of Marmora are very much fresher than the under layers, is not altogether justified, the difference being even less than is found in the Black Sea. None of the water samples examined contained sulphuretted hydrogen, and no sulphide of iron was detected in the bottom samples even in a new sounding of 746 fathoms, 100 fathoms greater than had hitherto been obtained. The amount of dead organic matter is much greater in the Sea of Marmora than in the eastern Mediterranean, and to this fact Natterer ascribes the greatly increased opacity of the water: that Constantinople is not the cause appears from the observation that the eastern and western portions of the sea are equally impure. The putrefaction of the organic matter occurs in the first place through the oxidation of the albuminous parts of the floating particles; and from their relatively large quantity so much carbonic acid is set free, that, instead of the usual alkaline reaction, the waters of the Sea of Marmora give characteristic reactions of carbonic acid. One important result of this peculiarity is, that in the Sea of Marmora a constant dissolving process is going on, instead of, as in the eastern Mediterranean and the Ægean, constant chemical precipitation. Natterer points out the marked influence of this process of solution in deepening the basin of the Sea of Marmora, particularly where, as often happens, the submarine cliffs are precipitous: land-slips stir up the bottom mud, which is then removed by the currents. Further chemical and physical evidence shows the existence of ascending and descending currents, and it seems reasonable to suppose that not only here, but in the oceans generally, the nitrous and carbonic acids formed in the depths provide nourishment for the plant-life growing in the sunlight at the surface. Natterer finds very complete mixture of the waters throughout the whole of the Sea of Marmora, and concludes that the surface current from the Black Sea and the bottom current from the Mediterranean give rise to a cyclonic circulation of the nature already suggested by his work in parts of the Mediterranean. Chemical observations show that the sinking down of surface water is most marked in the central and deepest parts of the Sea of Marmora, and the average specific gravity from surface to bottom is less there than near the coasts. If we suppose a condition of hydrostatic and not hydro-dynamic equilibrium to exist, the level of the water surface at the centre of the Sea of Marmora must be some 20 feet higher than at the coasts. The active vertical circulation produces a remarkable effect in the distribution of temperature, the mean temperature near the bottom being almost exactly the mean temperature of the air at stations round the coasts. The Sea of Marmora resembles in many ways an inland lake, through which a large river is flowing, and the absence of detritus brought down by the stream makes it an exceptionally good field for the chemical study of the circulation in all the complex modifications produced by the varied relief of the bottom.

The Sonnblick Observatory.—A general meeting of the Sonnblick-Verein was held on April 6 of this year. The President, Colonel Edler von Obermayer, was able to report an increase in the number of members, but urged the necessity of obtaining still wider support in the future. A paper on the scientific results of the Sonnblick observations up to the present time was read by Dr. W. Trabert. First must be placed the startling result reached by Hann, chiefly from a discussion of the Sonnblick observations, that the central column of air in a cyclonic system does not ascend by reason of relatively higher temperature, being, in fact, colder than the air surrounding it; nor does the air in the descending current of an anti-cyclone attain its greater relative density by reason of lower temperature. This conclusion produced almost a revolution in the domain of dynamical meteorology, as it was practically a death-blow to what was known as the convectional theory of cyclones. Dr. Trabert gave an account of some researches made by himself on the warming of the air by direct absorption of the sun's heat at a mountain summit. The results, which have already been published in full, show that, as at lower levels, the air is chiefly warmed by convection from the Earth's surface. Hann has further succeeded in estimating the daily range of temperature in the free air not affected by ascending and descending currents from mountains—an investigation which was always supposed to involve observations from balloons. In a zone such as that between the summits of the Sonnblick and Mont Blanc, the daily range was found to amount to only 1° C. Hann further points out that the Sonnblick observations agree with those of other mountain stations in throwing considerable doubt on current theories explaining variations of wind velocity. Investigations more in the domain of pure physics have been made by Elster and Geitel, on the nature of St. Elmo's fire, the atmospheric absorption of the ultra-violet rays, etc. Trabert and Pernter are at present engaged in an extensive work dealing with the general geographical relations of the results just enumerated.

Physical Geography.—Professor W. M. Davis, whose remarkable treatise on some English rivers was recently published in the *Journal*, has undertaken to contribute a series of "Current Notes on Physiography" to the American weekly *Science*, which was resuscitated at the beginning of this year. In the first instalment he dwelt very strongly on the importance of the geographical education of topographers, pointing out that much of the detail of all maps must be sketched in by the eye, and that an eye trained to appreciate geographical forms is the only guarantee of accuracy and excellence in the minor details of a map. He pleads strongly the importance of full University recognition of geography, with special reference to this application. The notes appear every few weeks, and deal mainly with American work, giving a sketch of the progress now being made in the study of physical geography in the United States.

OBITUARY.

Hugh F. C. Cleghorn, M.D., LL.D., F.R.S.E.

Dr. Hugh Cleghorn, who had been a Fellow of the Royal Geographical Society for thirty years, died at his estate of Stravithie, in Fifeshire, on May 17, aged seventy-four. He was born at Madras in 1820, and educated at Edinburgh and St. Andrews. He graduated as M.D. in 1841, and went out to India, where, while attached to the Madras General Hospital, he found much time to devote to his favourite study, botany. While in England in 1851, he took part in cataloguing the raw products shown in the great Exhibition, and on returning to India he was entrusted with the task of organizing a Forest Department in Madras, with the special object of checking the reckless system of cultivation then prevalent. After studying the forests of all parts of India, he elaborated a scheme, which ultimately grew into the present Forest Department of India. Jointly with Sir Dietrich Brandis, he was the first Commissioner for the Conservancy of Forests, and later he became Inspector-General of Forests. Dr. Cleghorn retired and left India in 1869, living for the most part the quiet life of a country gentleman at Stravithie, although he never ceased to do all in his power for the promotion of arboriculture and botany in this country. On one occasion he took the place of the Professor of Botany at Glasgow for a session, and he also acted as Examiner in Botany for medical and science degrees at Edinburgh University. His sympathetic manner as an examiner endeared him to the students who passed under his criticism, and the gentle courtesy which distinguished him through his whole life drew towards him the affection of his contemporaries, and especially of his subordinates, to a degree rare in public men. Dr. Cleghorn was instrumental in securing the establishment of a Lectureship of Forestry in Edinburgh University, which it was his aim to develop into a full Professorship.

William Alfred Eckersley.

This promising young Fellow of the Society, whose death has recently taken place, was born at Silverdale, near Lancaster, on January 25, 1856. He was educated at Marlborough School, and at Pembroke College, Oxford. On leaving Oxford he served a pupilage as engineer of three years (1874–1877) to his father, Mr. W. Eckersley, M.I.C.E. From 1879 to 1882 he had charge, first, of river protection works on the Thames, and, secondly, of the construction of a sea-wall and land-reclamation works at Trouville-sur-Mer, France.

From 1882 to 1886 he was engaged in the location, and had charge of a section under construction of the Jerez-Algeziras Gibraltar railway. From 1886 to 1892 he was engaged in railway construction and inspection in various parts of the world.

In April, 1893, he sailed to South Africa to report on the proposed extension of a railway from Fontesvilla to Salisbury in the British South African Company's possessions. He was commissioned by Messrs. James Livesey & Son to survey and superintend the whole of this business. He returned home at the end of 1893. A very interesting paper by Mr. Eckersley appears in the *Geographical Journal* of January, 1895, called "Notes in Eastern Mashonaland," which gives an account of his work in connection with this survey. In August, 1894, he went out to Salvador to report on the railway in this Central American republic, and he had also to survey the projected extension's between a station on the Santa Ana railway now in construction, and the town of San Salvador, the capital of the republic. It was during the discharge of his duties that he contracted the fatal illness, terminating in yellow fever, which ended his valuable life. Leave had been granted him for a brief holiday in England, and he was to have sailed on April 28, five days after his death. Mr. Eckersley married Miss Rachel Huxley in 1885, by whom he had three children.

Obituary of the Year.

The following is a list of the Fellows of the Society who have died during the year 1894–95 (May 13):—

The Right Hon. Lord Aberdare; E. C. Adams; G. A. Anstey; George Arbuthnot; Rev. Brymer Belcher; Richard Blanchard; Rev. W. J. Bowden; W. J. Browne; Sir E. H. Bunbury; S. M. Burroughs; H. T. Caine; Robert Campbell; W. W. Cargill; R. T. Cocks (late Treasurer of the Society); the Right Hon. Lord Coleridge; Sir William Collins; F. H. Copland-Crawford; General R. F. Copland-Crawford; Charles Cory; Sir J. C. Cowell; F. J. Crocker; Professor J. D. Dana; Wm. A. Fenner; Hon. C. W. Fitzwilliam; General J. E. Gastrell; Alfred Gillett; Sir C. C. Graham; Colonel W. Gray; E. Haldane; Rev. Edwd. Hale; W. Edwd. Hall; Colonel Charles Harding; Joseph Hargrave; General Sir J. S. Hawkins; John Henderson; A. R. Hollebone; Hugh Hughes; W. L. Hunter; Rev. C. E. Ingham; Admiral Sir Edward A. Inglefield; H. H. Ismail Pacha (Ex-Khedive of Egypt); T. M. Rymer Jones; Sir D. A. Lange; Right Hon. Sir Austen H. Layard; C. R. Lindsay; S. P. Low; W. C. M. Macdonald; A. J. Marshall; Colonel Sir G. Maude; John Maxwell; Robert McIlwraith; Thomas B. Muggeridge; Major W. G. Murray; W. Shore Nightingale; Baron de Overbeck; H. R. H. le Comte de Paris; Sir Robert Peel; C. B. Phillimore; Colonel J. Puget; Major-General Sir Henry C. Rawlinson; Brig.-Surg. W. Robertson; John Rogerson; Captain D. G. Sandeman; Samuel Sanders; C. K. Sharp; Henry P. Sharp; General Philip Smith; W. J. Steains; H. S. Stower; G. H. Strutt; Colonel S. W. Stuart; Courtenay Tagart; George Tinline; F. Tooth; P. D. Tuckett; Captain A. W. Twyford; George Tyler; Colonel A. D. Vanrenen; Professor Veth; Anthony Walter; E. H. Watts; Robert White; E. C. Williams; Admiral Thomas Wilson.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1894–95.

Anniversary Meeting, May 27, 1895.—Clements R. Markham, Esq., c.b., f.r.s., President, in the Chair.

At the commencement of the proceedings the Honorary Secretary (Mr. H. Seebohm) read the rules, which govern the business of the meeting.

The President next appointed Mr. Hugh Leonard and Captain Henderson Smith scrutineers for the ballot about to take place.

ELECTIONS.—*Samuel S. Allen, B.A.; Tempest Anderson, M.D., etc.; Sir George Baden-Powell, K.C.M.G., M.P.; Luke Bishop; Captain A. M. Boisregon; John Carder; C. W. Cayzer, M.P.; Leonard Cooper; W. H. Crosse; George Gough Dixon; Christopher T. Elmslie; Lieut. Arthur Henry Stuart Elwes, R.N. (retired); C. W. Gallwey; Francis Edward Halsey; C. E. Harrison; Plantagenet Charles Martell; Ernest George Mayse; Captain Chas. L. Morris-Newman; Arnold Pike; Don Frederico Pezet; D. W. Prowse; Bernard Alfred Quaritch; Thomas Godolphin Rooper; Rev. Graham Sandberg; H. L. Searle; Edwin Speight; Isaac Edwin Segmann; John Warren.*

The Annual Report of the Council was then read.

REPORT OF THE COUNCIL.

The Council have the pleasure of submitting to the Fellows the following Report on the general and financial condition of the Society:—

Membership.—The number of Fellows elected during the year ending May 13, 1895, was 207, and three Honorary Corresponding Members. In the previous year, 1893–94, the total elections amounted to 240, and in 1892–93 the number was 348. Our losses have been, by death 80 (besides 1 Honorary and 3 Honorary Corresponding Members), by resignation 62, and by removal on account of arrears of subscription 52; making a total increase of membership for the year of 12. In the year 1893–94 there was an increase of 29, in 1892–93 an increase of 166, in 1891–92 a decrease of 23. The total number of Fellows on the list (which does not include those (50) who have been elected but have not yet paid the fees, and exclusive of Honorary and Honorary Corresponding Members) on May 13 was 3703.*

Finance.—As will be seen by the annexed Balance Sheet, the total net income for the Financial year ending December 31, 1894 (*i.e.* exclusive of balance in hand and sale of Stock), was 9853*l.* 4*s.* 6*d.*, of which 6852*l.* 10*s.* consisted of entrance fees and subscriptions of Fellows. In the previous year, 1893, the total net income was 11,050*l.* 2*s.* 1*d.*, and the amount of subscriptions, etc., 7458*l.* 10*s.*; in 1892, the two totals were 9299*l.* 18*s.* 7*d.* and 7007*l.* respectively.

The net expenditure for the past year (*i.e.* exclusive of balance in hand and alterations to premises) was 9583*l.* 0*s.* 5½*d.* The net expenditure in 1893 was 11,584*l.* 2*s.* 3*d.*; in 1892, 9012*l.* 7*s.* 5½*d.*

The Finance Committee of the Council have held, as usual, meetings during the year, supervising the accounts of the Society. The Annual Audit was held on April 25 last, the Auditors being, on behalf of the Council, Sir Rawson W. Rawson and Howard Saunders, Esq., and on behalf of the Fellows at large, E. O. Tudor, Esq., and J. Duncan Thomson, Esq. The cordial thanks of the Council and Fellows are due to these gentlemen for having freely devoted their valuable time to this important task. At the end of their labours the Auditors drew up the following Report to the Council:—

Auditors' Report.—"The Auditors appointed to examine the Accounts of the Royal Geographical Society for the year ended December 31, 1894, have examined the Balance Sheet presented to them, and have compared it with the Books and Vouchers. They have found it correctly stated and sufficiently vouched. The Books have been kept and the Accounts rendered in the usual satisfactory manner.

"The gross receipts of last year amounted to 11,357*l.*, and the gross expenditure to 11,061*l.*; but these figures included a sale of Stock yielding 1500*l.*, and an expenditure on alterations to the House, including an introduction of the Electric Light throughout the building, amounting to 1478*l.* Deducting these extraordinary items and the balances, the net ordinary receipts of the year amounted to 9853*l.*, and the net ordinary expenditure to 9583*l.* The year began with a balance of 3*l.* 18*s.* 2½*d.*, and closed with one of 295*l.* 10*s.*

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* It will be observed that the elections are given for the year ending May 13, the accounts for the year ending December 31.

"The Auditors abstain from the usual comparison of the figures of 1894 with those for the year immediately preceding, because, as was pointed out in the Auditors' Report for last year, the receipts and expenditure of 1893 were abnormally increased—on the one side by the legacy of 1000*l.* from the late Earl of Derby, a large sale of Stock, and a modification of the Rules relating to Life Compositions; and on the other side by a correspondingly large purchase of Stock and several unusually heavy items of expenditure. But a comparison with the last normal year, 1892, shows satisfactory results, and a return to a normal condition of finance. In 1892, the net receipts, excluding balance on January 1, were 9300*l.*, and the expenditure 9012*l.*, leaving a balance of 288*l.*; in 1894, the corresponding receipts were 9853*l.*, an increase of 583*l.*, and the expenditure was 9583*l.*, leaving a balance of 295*l.*

"With regard to the receipts of last year, it is satisfactory to notice that while the Life Compositions fell off by 600*l.*, the Annual Subscriptions, which are the main support of the Society, increased by 316*l.*, and that the profit under the head of Publications of the Society increased by 511*l.*; also, on the other hand, there was a reduction of 1033*l.* in the expense of publishing the *Journal.* A new edition of 'Hints to Travellers' was published at a cost of 568*l.*; but the charge of publishing 'Supplementary Papers' was reduced by 442*l.*

"The following statement of the net receipts and expenditure of the last five years, exclusive of Balances and Investments, affords proof of the substantial progress and present sound position of the Society's Finances.

	Net Receipts. £	Net Expenditure. £	Difference. £
1890 (year of Mr. Stanley's return)	9532	8219	1313 +
1891	8323	8171	152 +
1892	9300	9012	288 +
1893	11051	11584	533 −
1894	9853	9583*	270 +

"The Investments of the Society have been reduced by a sale of Consols for 1454*l.* 11*s.* 11*d.*, yielding 1500*l.*, and applied to alterations and improvements in the House, and now stand at 20,148*l.* 0*s.* 5*d.*†

"The Arrears of Subscriptions have been reduced from 1521*l.* to 1418*l.*

"The Total Assets of the Society as estimated in 1893 at 47,745*l.* 3*s.* 0½*d.*, may now be estimated at 47,287*l.* 7*s.* 6*d.*

"Rawson W. Rawson,
"Howard Saunders,
"J. D. Thomson,
"E. O. Tudor,
} *Auditors.*

"*April* 25, 1895."

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* Special for Alteration, 1478*l.*

† Nominal value; the true value in April being 26,424*l.* 17*s.* 6*d.*

Receipts. **BALANCE SHEET FOR THE YEAR 1894.** *Expenditure.*

1894.	£	s.	d.	£	s.	d.
Balance in hand Dec. 31, 1893	..		..	3	18	2¼
Subscriptions :—						
Arrears	442	0	0			
For the current year ..	4138	0	0			
Paid in advance	790	0	0			
				5370	0	0
Entrance Fees	..		..	930	0	0
Life Compositions	..		..	552	10	0
Parliamentary Grant ..	..		..	500	0	0
Royal Premium	..		..	52	10	0
Rent of Shop	..		..	107	10	0
Publications :—						
Advertisements in *Journal*	542	15	0			
Sale of *Journal*	485	6	3			
Sale of 'Hints to Travellers'	107	0	0			
Sale of Old Series of *Proceedings*	116	18	0			
Other Publications ..	46	17	3			
				1298	16	6
Payments for Scientific Instruction	..		..	81	5	0
Educational Lectures :— Sale of Tickets	..		..	37	18	6
Loan of Diagrams and Slides	..		..	5	15	3
Payments in error . ..	..		..	54	16	9
Miscellaneous Receipts ..	..		..	8	11	0
Dividends :—						
North-Eastern Railway 4 per Cent. Debenture Stock .. .. 1000*l.*	38	15	10			
Great Indian Peninsula Railway 5 per Cent. Stock .. .. 4850*l.*	276	10	3			
Great Western Railway 4½ per Cent. Stock [Davis bequest] 1800*l.*	74	3	9			
London and North-Western Railway 4 per Cent. Stock [Murchison bequest] 1334*l.*	38	16	2			
Caledonian Railway 4 per Cent. Preference Stock .. .. 2000*l.*	77	11	2			
Norwegian 4 per Cent. Bonds .. .. 1000*l.*	44	15	10			
New Zealand 4 per Cent. Stock . 1000*l.*	38	13	4			
New South Wales 3½ per Cent. Stock [Gill Memorial] 1028*l.* 5*s.* 6*d.*	34	17	4			
India Stock .. 1000*l.*	33	18	2			
India 3½ per Cent. Debentures . 1000*l.*	31	9	8			
Consols . 1064*l.* 10*s.* 3*d.*	67	2	10			
„ [Peek Fund] 1000*l.*	26	12	10			
„ [Back bequest] 561*l.* 0*s.* 8*d.*	14	19	0			
„ [Trevelyan bequest] 510*l.* 4*s.* 0*d.*	13	11	4			
Metropolitan 3½ Consols 1000*l.* [Derby Legacy]	35	9	0			
Bonus on conversion of Norwegian Bonds and Interest	16	5	0			
				853	11	6
Sale of Stock (1454*l.* 11*s.* 11*d.*):— Alterations to House ..	..		..	1500	0	0
			£	11,357	2	8¼

1894.	£	s.	d.	£	s.	d.
House :—						
Taxes and Insurance ..	110	6	8			
Coals, Light and Water	135	10	1			
Repairs	94	13	1			
Miscellaneous..	128	6	1			
				468	15	11
Office :—						
Salaries and Gratuity ..	1038	0	0			
Stationery and Printing	292	17	6			
Miscellaneous	161	12	10¼			
				1482	10	4¼
Library :—						
Salaries	340	0	0			
Books and Binding ..	128	11	8			
Library Catalogues ..	130	0	0			
Miscellaneous	152	9	5			
				751	1	1
Map-room :—						
Salaries	548	4	2			
Purchase of Maps, etc. .	50	17	6			
Repairs to Instruments	6	1	0			
Miscellaneous	111	12	4			
				716	15	0
Map-Drawing Room :—						
Salaries	300	0	0			
Miscellaneous	3	11	0			
				303	11	0
Meetings :—						
Evening Meetings ..	302	11	6			
Anniversary Dinner ..	52	15	7			
Miscellaneous	73	18	1			
				429	5	2
Medals and other Awards ..	..		..	228	7	3
Education :—						
Scientific Instruction ..	167	0	0			
Oxford and Cambridge Universities	225	0	0			
Oxford Studentship ..	50	0	0			
Owens College	50	0	0			
Educational Lectures ..	188	7	8			
Miscellaneous	22	14	9			
				703	2	5
Publications :—						
Printing *Journal*	1070	7	8			
Postage and Addressing	613	17	11			
Separate copies	31	13	3			
Maps	484	18	0			
Illustrations	54	18	3			
Payments to Contributors	250	0	0			
Editor of Publications ..	200	0	0			
Miscellaneous	135	15	3			
				2841	10	4
'Supplementary Papers'—Printing..	141	18	9			
Maps	162	9	11			
				304	8	8
Payment to Mr. Rockhill	..		..	150	0	0
Printing Mr. Conway's Map	..		..	101	18	6
'Hints to Travellers'—Printing	420	0	0			
Maps	67	0	0			
Contributors	81	11	0			
				568	11	0
Expeditions :—						
Grant to Mr. Paton ..	25	0	0			
Grant to Mr. J. T. Bent	100	0	0			
Asia Minor Exploration Fund	30	0	0			
Instruments	349	3	9			
				504	3	9
Payments in error	..		..	29	0	0
Alterations to House ..	..		..	1478	12	3
Balance in Bankers' hands, Dec. 31, 1894	275	8	6			
Do. Accountant's do.	20	1	6			
				295	10	0
			£	11,357	2	8¼

E. L. S. COCKS,
Treasurer.

Audited and found correct, April 25, 1895.

RAWSON W. RAWSON,
HOWARD SAUNDERS,
J. D. THOMSON,
E. O. TUDOR,
} *Auditors.*

STATEMENT showing the RECEIPTS and EXPENDITURE of the Society from the Year 1848 to December 31, 1894.

Year.	Cash Receipts within the Year.			Cash Amounts invested in Funds.			Deducting Amounts invested in Funds; actual Expenditure.		
	£	s.	d.	£	s.	d.	£	s.	d.
1848	696	10	5	..		..	755	6	1
1849	778	3	0	..		..	1098	7	6
1850	1036	10	5	..		..	877	2	10
1851	1056	11	8	..		..	906	14	7
1852	1220	3	4	..		..	995	13	1
1853	1917	2	6	..		..	1675	6	0
1854	2565	7	8	..		..	2197	19	3
1855	2584	7	0	..		..	2636	3	1
1856	[1] 3372	5	1	533	10	0	2814	8	1
1857	3142	13	4	378	0	0	3480	19	9
1858	3089	16	1	..		..	2944	13	6
1859	3471	11	8	950	0	0	3423	3	9
1860	[2] 6449	12	1	466	17	6	5406	3	7
1861	4792	12	9	1358	2	6	3074	7	4
1862	4659	7	9	1389	7	6	3095	19	4
1863	5256	9	3	1837	10	0	3655	4	0
1864	4977	8	6	1796	5	0	3647	7	10
1865	4905	8	3	1041	5	0	4307	4	5
1866	5085	8	3	1028	15	0	4052	15	0
1867	5462	7	11	1029	0	6	3943	17	4
1868	5991	4	0	1857	3	9	4156	17	10
1869	[3] 6859	16	0	2131	5	0	4646	0	8
1870	[4] 8042	6	1	3802	6	0	3845	10	0
1871	[5] 6637	3	7	1000	0	0	3726	4	4
1872	[6] 8119	7	9	1999	4	6	5871	13	2
1873	[7] 7761	18	10	2015	1	8	6697	12	6
1874	[8] 8753	5	10	499	0	0	7876	2	3
1875	7934	15	10	2002	7	6	5683	4	10
1876	[9] 11611	11	8	..		..	6870	13	1
1877	[10] 7950	1	11	2538	2	0	8940	17	11*
1878	[11] 8124	10	0	3000	0	0	6361	9	6
1879	[12] 8979	14	10	1551	10	10	6990	14	2
1880	8599	18	4	1567	5	1	8454	1	10†
1881	8809	19	5	..		..	8362	5	6‡
1882	[13] 8942	15	0	..		..	8779	10	7
1883	[14] 9599	9	0	1001	5	0	8624	2	11
1884	[15] 8964	11	7½	..		..	9266	0	5
1885	[16] 8738	12	3	..		..	8555	3	10½
1886	[17] 7968	9	0	1000	0	0	7767	18	0½
1887	8007	16	3	..		..	8493	10	3
1888	8053	5	0	..		..	7908	18	6
1889	8224	7	7	1000	0	0	7025	15	10
				On deposit.					
1890	9531	16	2	850	0	0	8218	5	10
1891	8322	16	8	1000	0	0	8171	3	9
1892	9299	18	7	..		..	9012	7	5½
1893	[18] 11050	2	1	1150	0	6	11584	2	3
1894	9853	0	0	..		..	9583	0	0

[1] Includes Treasury Grant of 1000*l.* for the East African Expedition.

[2] Includes Treasury Grant of 2500*l.* for the East African Expedition.

[3] Includes Legacy of Mr. Benjamin Oliveira, 1506*l.* 17*s.* 1*d.*

[4] Includes Legacy of Mr. Alfred Davis, 1800*l.*

[5] Includes Legacy of Sir Roderick Murchison, 1000*l.*

[6] Includes Mr. James Young's Grant for Congo Expedition, 2000*l.*

[7] Includes 1009*l.* 14*s.* 6*d.*, sale of Exchequer Bills.

[8] Includes Mr. James Young's Grant for the Congo Expedition, 1041*l.* 14*s.*

[9] Includes Parliamentary Grant of 3000*l.* to Cameron Expedition.

[10] Includes Donation of 500*l.* by Mr. C. J. Lambert.

[11] Includes Legacy of Admiral Sir George Back, 540*l.*

[12] Includes Legacy of Sir W. C. Trevelyan, 500*l.*

[13] Includes 1005*l.* 8*s.* 2*d.*, sale of Exchequer Bills.

[14] Includes 1000*l.* received from Mr. B. Leigh Smith.

[15] Includes 500*l.* on loan from Bankers.

[16] Includes 998*l.* 0*s.* 10*d.*, sale of India Debentures.

[17] Includes Donation of 1000*l.* from Miss Gill.

[18] Includes Legacy of the Earl of Derby, 1000*l.*

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* This sum includes the Special Parliamentary Grant transferred to the Cameron Expedition Fund in February, 1877.

† This amount includes the payment of two sums of 500*l.* each, contributed to the African Exploration Fund in this and the previous year.

‡ This sum includes the payment of 102*l.* 8*s.* to the African Exploration Fund; also 714*l.* 9*s.* 1*d.*, the final payment for Cameron Expedition Fund.

STATEMENT OF ASSETS.—December 31, 1894.

		£	s.	d.
Freehold House, Fittings, and Furniture, estimated (exclusive of Map Collections and Library insured for 10,000*l.*)	.. ..	20,000	0	0
Investments (amount of Stock), as detailed in the above Report of the Auditors, valued April last at	.. ..	26,424	17	6
Arrears due on December 31, 1894, 1418*l.* Estimated at	.. ..	567	0	0
Balance at Bank	£275 8 6			
„ in Accountant's hands..	20 1 6			
		295	10	0
Total		£47,287	7	6

ESTIMATE FOR THE YEAR 1895.

RECEIPTS.	£	s.	d.
Subscriptions	5450	0	0
Entrance Fees	900	0	0
Life Compositions	600	0	0
Parliamentary Grant	500	0	0
Royal Premium	52	10	0
Rent of Shop	86	0	0
Publications	1200	0	0
Payments for Scientific Instruction	60	0	0
Payments made in error	50	0	0
Sale of Copper Plates	13	14	10
Loan of Diagrams and Slides	8	0	0
Educational Lectures	20	0	0
Sale of *Proceedings* (Old Series)	50	0	0
Dividends	850	0	0
Total	£9840	4	10

EXPENDITURE.	£	s.	d.
House	470	0	0
Office	1468	0	0
Library	820	0	0
Printing Catalogue	500	0	0
Map Room	686	0	0
Map-Drawing Room	458	0	0
Meetings	654	0	0
Medals and other Awards	170	0	0
Education	753	0	0
Publications:			
Journal	3050	0	0
'Supplementary Papers'	200	0	0
Expeditions	255	0	0
Engraving New Diploma	40	0	0
Messrs. Fox and Bousfield	105	0	0
Alterations to House (Balance)	21	7	9
Payments in error returned	30	0	0
Balance available for contingencies	159	17	1
Total	£9840	4	10

Amount of Guarantee, viz. 600*l*., to the International Geographical Congress, not included in the estimates of 1895.

Publications.—The monthly *Journal* has been issued with regularity throughout the year; the twelve numbers for 1894 forming two volumes of 1194 pages, illustrated by 35 maps and 62 illustrations. The total cost of the edition of 5500 copies (including 613*l*. 17*s*. 11*d*. for free delivery to Fellows and Institutions) was 2841*l*. 10*s*. 4*d*. From this is to be deducted the amount of 1028*l*. 1*s*. 3*d*. received from sale of copies to the public and from advertisements. The sum of 304*l*. 8*s*. 8*d*. was expended on 'Supplementary Papers.'

Alterations to House.—Since the issue of the last Report considerable alterations and repairs have been carried out for the convenience and comfort of the Fellows. The electric light has been introduced throughout and large additions made to the Library and Map accommodation, and other improvements which it is believed will add to the efficiency of the Society. The total cost of alterations amounted to 1478*l.* 12*s.* 3*d.*

Library.—During the past year 735 books and pamphlets, in addition to serial publications, have been added to the Library—580 by donation and 155 by purchase; 90 pamphlets have been put in covers by the Society's map-mounter, and 160 volumes have been bound.

The sum of 82*l.* 10*s.* 11*d.* has been spent in books, and 31*l.* 5*s.* for binding.

Library Catalogues.—The Catalogue of the Library arranged alphabetically according to the names of Authors, with supplements (1) detailing the contents of collections of travels, (2) classifying official and anonymous writings, and (3) enumerating transactions and periodicals, is now completed. As soon as the copies are bound they will be issued to Fellows on application.

Work has been continued on the great Subject Catalogue, but this has not been pressed forward in order to allow of the more rapid completion of the Authors' Catalogue.

Presentations to the Library.—The accessions of new books are duly notified in the *Geographical Journal* for each month. The leading English publishers have presented most of the important geographical works published by them during the year; the Secretary of State for India has supplied numerous official publications, and other standard books on India and oriental affairs, while the Agents-General and governments of the colonies have sent their official publications. H.M. Treasury Office has during the year presented two volumes of the *Challenger* report, completing the record of this great national enterprise. The Arch-Duke Ludwig-Salvator of Austria has presented the concluding parts of his princely work on the Lipari Islands. Amongst private benefactors of the Library the name of Dr. R. N. Cust may be mentioned for his gift of twenty volumes on Ethnography.

Instruction.—During the past year 40 intending travellers have received instruction from Mr. Coles, in Practical Astronomy, in the Society's Observatory, and in surveying with the theodolite, prismatic compass, and plane-table, in the country, and 529 hours have been devoted to teaching.

Instruments to the value of 594*l.* 18*s.* have been lent during the past year to the following travellers:—Mr. A. Trevor-Battye (Arctic Regions), 47*l.*; Dr. Donaldson Smith (Somaliland), 103*l.* 5*s.*; Dr. Forsyth Major (Madagascar), 5*l.* 15*s.*; Mr. J. T. Last (Madagascar), 65*l.* 14*s.*; Hon. G. N. Curzon, M.P. (Central Asia), 17*l.* 16*s.*; Mr. S. Vandeleur, Scots Guards (Uganda), 54*l.*; Mr. J. A. R. Munro (Asia Minor), 12*l.* 10*s.*; Mr. C. M. Woodford (Pacific Islands), 29*l.*; Mr. St. G. R. Littledale (Central Asia), 81*l.* 6*s.*; Captain A. St. H. Gibbons (South Central Africa), 71*l.* 7*s.* 6*d.*; Mr. F. C. Selous (South Central Africa), 4*l.* 10*s.*; Sir William Macgregor, K.C.M.G. (British New Guinea), 102*l.* 14*s.* 6*d.*

The instruments lent to the following gentlemen have been returned during the past year, with the exception of those which have been lost:—Major Heath, R.E. (Asia Minor), 1894; Monsieur H. M. P. de la Martinière (Morocco, 1889); Rev. Thomas Wakefield (East Africa), 1883; Mr. D. G. Hogarth (Asia Minor), 1893; Sir William Macgregor (British New Guinea), 1893; Rev. Walter Weston (Japan), 1893; Mr. A. Trevor-Battye (Arctic Regions), 1893–94; Hon. G. N. Curzon, M.P. (Central Asia), 1894; Mr. J. A. R. Munro (Asia Minor), 1894; Mr. G. F. Scott-Elliot (Lake Region, Central Africa), 1893.

The following is a list of travellers who still have instruments lent to them in their possession:—Mr. E. Douglas Archibald (for cloud observations in England), 1885; Mr. T. Bevan (New Guinea), 1887; Mr. H. H. Johnston (Nyasaland, Central Africa), 1889–91 and 94; Rev. A. Hetherwick (South-East Africa), 1891; Dr. D. Kerr Cross (South-East Africa), 1891; Sir C. M. Macdonald (Niger Region), 1891; Mr. C. W. Campbell (Korea), 1893; Lieut. Coningham (Persia), 1893; Mr. J. C. White (Sikkim), 1893; Mr. R. M. W. Swan (South-East Africa), 1893; Captain C. Webster (New Guinea), 1893; Rev. C. H. Robinson (Sahara), 1893; Mrs. Bishop (Korea), 1893; Lieut. F. W. Green, R.A. (Asia Minor), 1894; Mr. R. T. Coryndon (Mashonaland), 1894; Dr. Donaldson Smith (Somaliland), 1894; Dr. Forsyth Major (Madagascar), 1894; Mr. J. T. Last (Madagascar), 1894; Mr. S. Vandeleur, Scots Guards (Uganda), 1894; Mr. C. M. Woodford (Pacific Islands), 1894; Mr. St. G. R. Littledale (Central Asia), 1894; Captain A. St. H. Gibbons (South Central Africa), 1895; Mr. F. C. Selous (South Central Africa), 1895; Sir William Macgregor (British New Guinea), 1895.

Map Room.—The accessions to the Map Room Collection during the past year comprise 785 Maps on 1381 sheets; 29 Atlases (including continuations) containing 510 sheets of Maps, 1722 Photographs, 2 Sketches, and 358 Lantern Slides. Of these, 85 Maps on 488 sheets, 13 Atlases, 130 Photographs, and 358 Lantern Slides have been purchased.

All the more important donations to the Map Room Collection during the past year have been mentioned in the *Geographical Journal.*

The adoption of the Report was moved by Colonel E. S. Gordon, R.A., and seconded by Mr. R. A. Maclean.

PRESENTATION OF THE ROYAL MEDALS AND OTHER AWARDS.

The PRESIDENT: I have now the duty of presenting the Royal Awards to the recipients. Dr. Murray, the Founders' Medal has been adjudicated to you for your great services to physical geography, and especially to oceanography during the last twenty-three years. It is the highest honour that this Society has it in its power to bestow, and it certainly has seldom been more worthily adjudicated than on the present occasion. I well remember in, I think, December, 1872, going down to Sheerness to see all the preparations for scientific work on board the *Challenger.* It is well known how admirably that work was done in subsequent years by the naval officers and scientific staff of that ship. In that work you took your full share. And when afterwards the expedition returned, and on the lamented death of Sir Wyville Thompson, you became the editor of the results of that memorable expedition, a magnificent work, which is now completed in fifty quarto volumes. It was certainly a colossal undertaking. Your country has good reason to be proud of your labours, for they have raised her scientific credit throughout the civilized world, and you have given a stimulus to researches in physical geography which will be enduring. I think it cannot fail to give you additional pleasure, on the completion of your great work, to know that none rejoice more at your success than your old captain, the present Admiral Sir George Nares, and the other survivors amongst your shipmates in the *Challenger* expedition. I now have great pleasure in presenting you with the Founders' Medal.

After presenting the medal to Dr. Murray, the PRESIDENT said: Mr. Curzon, the Patron's Medal of the Society has been awarded to you for your monograph on Persia, containing so much geographical information; for the best existing map of Persia; for your travels in Korea and in French Indo-China; for your exploration of the Pamirs; for your determination of the true course of the Oxus; and for your valuable map of the Pamirs now in progress. I believe that the thoroughness and excellence of your work in connection with these journeys mainly influenced the decision of the Council. This is certainly the aspect of your geographical work which has impressed me most strongly. By diligent and exhaustive research you made yourself intimately acquainted with the history of the geography of those countries which you intended to explore. So far as I can see—and I have studied your works very carefully—nothing seems to have escaped you. You went forth as a knight fully armed for your work, and that is the way all travellers should go forth. You have thus set an admirable example. Speaking with knowledge, I believe that no traveller from this country, since the days when Sir Henry Rawlinson was young, has approached your excellence in this respect. If, as I anticipate, your exploring career is closed at least for a time, I feel quite sure that you will still wish to continue to be an active and zealous member of this Society, and a warm friend of geographical science. I have great pleasure, Mr. Curzon, in placing in your hands the Patron's Medal.

Dr. MURRAY: Mr. President, ladies and gentlemen, I can assure you that I appreciate very highly the honour that has been conferred upon me; but when I say that, sir, I would like you and the rest of the Fellows of the Society to understand that I appreciate even more the recognition of the *Challenger* expedition itself. Any reputation that I may have acquired in the pursuit of geographical and physical science is, I know too well, founded in the first place upon the work of my colleagues and messmates on board the *Challenger*, and in the second place on the work and labours of a large number of scientific men, both British and foreign, who have been engaged in working up the result of that famous expedition. Perhaps my sole merit is that I commenced with the expedition when it was initiated, and that I have continued to edit the reports of the scientific results that have at last been completed. My life and work have been a sort of thread running through the whole undertaking. I wish it to be distinctly understood, especially when I see some of my old messmates here, and some of the contributors to the report, that all the credit I take to myself is that I have happened to live through to the end, while so many of them have been called to other duties in public service, or have passed away altogether from the scene, and that the honour which has now been conferred upon me might, in other circumstances, also have very justly fallen upon some of them.

The Hon. G. N. CURZON, M.P., in acknowledging the award, said: Mr. President, ladies and gentlemen, You, sir, have told me I ought to follow what would indeed be my own personal inclination, namely, to say a few words to this Society in acknowledgment of the great compliment that they have paid to me. I do indeed feel, sir, almost more than I can describe, the honour that has been bestowed upon me by the gift of this medal, and also by the gracious words with which you have accompanied it. It is true that my travels, such as they have been, have been pursued under serious limitations both of area and of time. They have all been confined, in the first place, to the continent of Asia. I may confess that it was political rather than geographical interest that first took me to that continent, but nevertheless that section of the world's surface, which contains, as Asia does, the greatest mountains, the most imposing glaciers, the most interesting and historic rivers, and almost the widest plains on the surface of the globe, may claim an independent geographical, as well as a political, archæological, and historical interest. The second limitation under which I have suffered has been that of time, and this has been the necessary consequence of what has been absolutely the only exceptional feature of anything I have been able to do in the way of travel or geography—namely, that, owing to the external conditions of my life, I have only been able to take these journeys in the intervals of a parliamentary vacation. I believe I may say with truth, that I am the only member of parliament who has, during the period in which he has sat in the House of Commons, been honoured by the Royal medal of this Society. The whole of my journeys have been accomplished during the period in which I have had a seat at Westminster, and that is another way of saying that I have never had more than a seven months' holiday at a time. This has, I need hardly say, compelled me to be somewhat rapid in my journeys, and though that may have enabled critics to say that I was a globe-trotter of the Cook's tourist order, at the same time it has not prevented this Society from acknowledging some superior quality in these efforts. Sir, you have been good enough in your remarks to lay stress upon what to me has always been almost the first essential of travel, and that is a long, careful, and studious preparation for the work one is going to undertake. If any traveller in a similar position, or even in a different position to myself, came and said to me, "What would you recommend to any one going to undertake a journey in distant parts?" I would say to him, "In the first place, consult all the highest and most reliable authorities you can find. You will invariably meet with courtesy from them; you will receive from them excellent and invaluable advice. In the second place, read every book, good, bad, or indifferent, that has been written upon the country you propose to visit, so that you may know what to do, and what not to do. In the third place, take no superfluous baggage—it only employs extra time and men; in the fourth place, realize that travel has not only its incidents and adventures, but also its humour; and in the fifth place, never expect any encouragement from the government of your country." You, sir, have been kind enough to say that you hope that, although my travels may be somewhat more restricted in the future, I may still render such service as I am capable of to geographical science. With that wish I most heartily concur. I can only say that during the ten years or more that I have been connected with this Society, it has been a source to me, not merely of inspiration, but of delight. The Royal Geographical Society is an institution from whose officers you meet with every assistance, cordially given, that you can possibly require. There you receive inspiration before you start, and encouragement and reward when you return home. Both as its Councillor and Vice-President, and, at the present moment, as the grateful recipient of your medal, I greatly value my connection with this Society; and even although I may not be able to travel again, I shall never lose my interest in geographical science, and I hope still to be able to render some service to the Society.

The PRESIDENT: Mr. Gude, The Murchison Grant for 1895 has been adjudged to your countryman Mr. Eivind Astrup, for his remarkable journey with Lieutenant Peary across the interior glacier to the northern shores of Greenland; whilst he has also executed some interesting work on his own account along the coast of Melville Bay, and throughout he has shown most remarkable intrepidity and zeal for geographical discovery. The Back Grant has been awarded to another countryman of yours, Captain C. A. Larsen, for the geographical and meteorological observations made by him in 1894, when he penetrated beyond the Antarctic circle as far as the latitude of 68°. He is the first person, I think, who has discovered land—islands—beyond the Antarctic Circle, since the return of Sir James Ross's expedition in 1843, and it is with great pleasure that I place these two grants and the diplomas in your hands as the Secretary to the Legation of Sweden and Norway. I thank you, at the same time, on the part of the Society, for having been so good as to come here to receive them.

Mr. GUDE: Mr. President, I beg to express my thanks, and the best thanks of all my countrymen, for the great honour bestowed upon them, and I will not fail to report it to them.

The PRESIDENT: The Gill Memorial for 1895 has been awarded to Captain J. Pringle, R.E., for having sent us a very valuable account of the geographical work he has done under the orders of Major Macdonald, whilst engaged on the railway survey between Mombassa and Lake Victoria. Major Darwin has kindly undertaken to receive the diploma for him.

Major DARWIN, M.P.: I am glad to receive this diploma for a brother officer of my own.

The PRESIDENT: Mr. Scott-Elliot, The Cuthbert Peek Grant has been awarded to you for your exploration of Mount Ruwenzori, and of the country west of Victoria Nyanza, and for the additions made to our knowledge of the botanical geography of the African highlands. I have great pleasure in placing the grant in your hands.*

THE BALLOT FOR THE NEW COUNCIL.

The PRESIDENT then announced that, according to the report of the scrutineers, the list as prepared by the Council had been duly elected.

The list is as follows, the names of new members, or those who change office, being printed in *italics*:—

President:—Clements R. Markham, C.B., F.R.S., F.S.A. *Vice-Presidents*: W. T. Blanford, Esq., LL.D., F.R.S., F.G.S.; Hon. G. C. Brodrick; Hon. George N. Curzon, M.P.; *Sir George D. Taubman Goldie*, K.C.M.G.; General R. Strachey, R.E., C.S.I., F.R.S.; Rear-Admiral W. J. L. Wharton, F.R.S. *Treasurer*: Edward L. Somers Cocks. *Trustees*: Right Hon. Sir John Lubbock, Bart., F.R.S., M.P.; *Cuthbert E. Peek*, F.A.S. *Secretaries*: H. Seebohm, F.L.S.; Major Leonard Darwin, R.E., M.P. *Foreign Secretary*: Sir John Kirk, K.C.B., G.C.M.G., F.R.S. *Councillors*: *W. M. Beaufort*; Robert Brown, M.A., PH.D., F.L.S.; *George Cawston*; Right Hon. Hugh C. E. Childers, F.R.S.; General Sir T. E. Gordon, C.B., K.C.S.I.; Wilfred Hudleston, F.R.S., F.G.S.; Lord Lamington; J. K. Laughton; George Sutherland Mackenzie; Rear-Admiral Albert Hastings Markham; *A. P. Maudslay*; John Murray; Ernest G. Ravenstein; Howard Saunders, F.L.S., F.Z.S.; *Right Hon. the Earl of Scarbrough*; Rear-Admiral E. Hobart Seymour, C.B.; *Major the Hon. M. G. Talbot*, R.E.; Lieut-Colonel J. K. Trotter, R.A.; *General J. T. Walker*, R.E., C.B.; *Admiral Hon. W. J. Ward*; Lieut.-Colonel C. M. Watson, R.E., C.M.G.

The President then delivered his annual address (see p. 1), after which the Hon. G. C. BRODRICK spoke as follows: Ladies and gentlemen, I have been asked to say a few words, and they will be very few, in proposing what you will all anticipate—a vote of thanks to our President for his admirable address. We all remember that when our late President retired, the choice of his successor was a subject of some anxiety. I think we all feel that there are two great qualifications not very often combined in the same individual: a thorough knowledge and sympathy with geography, and, on the other hand, a thorough knowledge of the business of this Society—a knowledge which can only be obtained by long experience. Well, I am sure I speak the feelings of all present when I say that we find that combination in Mr. Markham to a degree which could not have been equalled by any other man. Some of us can remember Sir Roderick Murchison, and I do not suppose any of us who knew him expected that we should ever find a second Sir Roderick Murchison to preside over us in the Chair. We have had many eminent Presidents since that day, but I have no hesitation in saying that no one of them has come so near possessing the qualifications of Sir Roderick Murchison as our President of to-day. We have heard something of exceptional activity during the past year in the field of geographical exploration, but I am sure that there has been equally exceptional activity in the office of this Society, and the motive power of that activity has been our President. He has thrown life and spirit into the whole work of this Society, and I regard the excellent address we have just heard from him—summarizing so well the geographical work of the past year, and reminding us of the improvements that have been made in the buildings of the Society, and in so many other ways—I regard that address as only another proof of the wonderful and most successful energy which he has brought to bear upon every department of the work of this Society; and therefore I have the greatest pleasure in proposing a vote of thanks to him on this occasion.

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* The Medals for the promotion of geographical education, placed by the Society at the disposal of the Syndicates respectively of the Oxford and Cambridge Local Examinations, were awarded as follows:—

1894. Oxford (June).—*Silver Medal*—W. G. Bower. *Silver Medal*—E. W. Wallis. *Silver Medal*—P. Jarrett.

For the bronze medal no candidate of sufficient merit appeared.

Cambridge (December).—*Silver Medal* (Physical Geography)—Samuel Henry Clifford Briggs. *Silver Medal* (Physical Geography)—John Arnold Cherry. *Silver Medal* (Political Geography)—William Gregory Rivers. *Silver Medal* (Political Geography)—John Frame.

The prizes offered by the Society for geographical proficiency to the cadets of the Nautical Training Colleges, on board H.M.S. *Worcester* and *Conway*, were awarded at the examination held in July, 1894, to the following:—*Worcester* training-ship—First prize, to Algernon Percy Le Clerc Faught. Second prize, to Joseph Leonard Hall. *Conway* training-ship—First prize, to Herbert Raymond Bateman. Second prize, to Thomas Samuel Beauchamp Williams.

Vice-Admiral Sir GEORGE NARES, K.C.B.: I have much pleasure in seconding that resolution.

The PRESIDENT: I have been very much touched by Mr. Brodrick's kindness, and by the way in which he has alluded to my services. I am happy to think, at all events, that you understand that I have worked hard and done my best for the Society. Of course, no one knows better than I do my disqualifications for this post, and I can only feel thankful that you have not yet found them out. I hope that the day when you will do so is far distant. The meeting is now adjourned, and I trust that we shall all meet again at the reception this evening.

Special Meeting, June 6, 1895.—Admiral W. J. L. WHARTON, C.B., F.R.S., Vice-President, in the Chair.

The Paper read was :—

"An Expedition to the Frankincense Country, Southern Arabia." By J. Theodore Bent.

Thirteenth Ordinary Meeting, June 17, 1895.—The Hon. G. N. CURZON, M.P., Vice-President, in the Chair.

ELECTIONS.—*Rev. Edwin J. Frayling; Captain J. James; Captain C. E. Salvesen, R.E.; Cecil Harcourt Smith; Colonel Swinton, R.A.*

The Paper read was :—

"Armenia." By H. F. B. Lynch.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full :—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. R. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Alps—Transverse Valleys. *Z. Ges. Erdk. Berlin* 30 (1895): 1-94. **Futterer.**
Durchbruchsthäler in den Süd-Alpen. Von Dr. Karl Futterer. *With Maps and Profiles.*

France—Beaujolais and Lyonnais. *Ann. G.* 4 (1895): 287-309. **Gallois.**
Mâconnais, Charolais, Beaujolais, Lyonnais; III., le Beaujolais et le Lyonnais. Par M. L. Gallois.

Continuation of a series of papers on regional geography.

France—Languedoc. *B.S. Languedoc. G.* 17 (1894): 187-254. **Malavialle.**
Le littoral du Bas-Languedoc. Par M. L. Malavialle.

France—The Morvan. **Hovelacque and Hervé.**
Mem. S. d'Anthropologie Paris 1 (3 S.) (1894): 1-256.
Recherches éthnologiques sur le Morvan. Par Ab. Hovelacque et G. Hervé. *With Plate.*

This forms an "annexe" to the *Bulletin* of the Paris Anthropological Society.

France—Rhone Delta. *B.S. Languedoc. G.* 17 (1894): 5-23. **Flahault and Combres.**
Observations sur la part qui revient au cordon littoral dans l'exhaussement actuel du Delta du Rhone. Par MM. Flahault et Combres.

Germany—Lorraine. *Deutsche G. Blätter* 18 (1895): 19-35. **Gerdolle.**
Die Wälder Deutsch-Lothringens. Von H. Gerdolle. *With Map.*

Luxemburg. *B. Union G. Nord de la France* 15 (1894): 97-116. **Paillot.**
Le Grande-Duché de Luxembourg et Trèves, conférence faite par M. René Paillot.

Spain. **Luffmann.**
A Vagabond in Spain. By C. Bogue Luffmann. London: John Murray, 1895. Size 8 × 5½, pp. xvi. and 346. *Frontispiece. Price 6s. Presented by the Publisher.*

An entertaining account of a walk of 1500 miles through Spain from Biarritz to Malaga.

Sweden—Norrland. *Globus* 67 (1895): 245-248. **Deecke.**
Skizzen aus Norrland (Nordschweden). Von W. Deecke. Greifswald. *With Illustrations.*

ASIA.

Asia Minor—Railways. *Deutsche Rundschau G.* 17 (1895): 322-323. —
Die Eisenbahnen Kleinasiens *With Map.*

The map is on the scale of 1 : 5,800,000.

Barren Island. **Mallet.**
Records Geolog. Surv. India 28 (1895): 22-38.
Some early allusions to Barren Island; with a few remarks thereon by F. R. Mallett.
Bibliography of Barren Island and Naroondam, from 1884 to 1894; with some remarks by F. R. Mallet. *With Illustration.*

Central Asia—Mustagh-ata. *Z. Ges. Erdk. Berlin* 30 (1895): 94–134. **Hedin.**
Die Gletscher des Mus-tag-ata. Von Dr. Sven Hedin. *With Plates.*

Ceylon and India. **Klein.**
Among the Gods, Scenes of India; with Legends by the way. By Augusta Klein. Edinburgh and London: W. Blackwood & Sons, 1895. Size 9 × 6, pp. x. and 356. *Illustrations. Price* 15*s. Presented by the Publishers.*

A typical volume of "light travel," conveying a good deal of information as to the more frequently visited towns and temples of Ceylon and India, and illustrated by excellent photographs.

Russia—Aralo-Caspian Region. **Sjögren.**
Ueber das Diluviale, aralokaspische Meer und die nordeuropäische Vereisung. Von Hj. Sjögren in Baku. [From Jahrbuch der k. k. geol. Reichsanstalt, 1890, 40 Band. 1 Heft.] Size 10½ × 7½, pp. [26]. *Presented by the Royal University of Upsala.*

Russia—Transcaspian Railway. *Ann. G.* 4 (1895): 325-345. **Blanc.**
Le chemin de fer Transcaspien. Par M. Éd. Blanc. *With Sketches.*

CENTRAL AND SOUTH AMERICA.

Brazil—Amazonas. **Leal.**
Viagem a um paiz de selvagens. Por Oscar Leal. Lisbon: Antonio Maria Pereira, 1895. Size 7½ × 5½, pp. 232. *Illustrations. Presented by the Author.*

Ecuador—Galapagos. **White.**
A needed foothold in the Pacific. By Arthur Silva White. From the *United Service Magazine*, September, 1894. Size 9½ × 6, pp. [6].

Mr. Silva White points out the importance of the Galapagos Islands as a point on the new routes across the Pacific.

Paraguay. *J.S. Arts* 43 (1895): 353-364. **Baillie.**
The Republic of Paraguay. By Alexander F. Baillie.

Jamaica. **Musson and Roxburgh.**
The Handbook of Jamaica for 1895. Published by Authority, comprising Historical, Statistical, and General Information concerning the Island. Compiled . . . by S. P. Musson and T. Laurence Roxburgh. London: E. Stanford, 1895. Size 8½ × 6, pp. viii. and 590. *Map. Price* 8*s. Presented by the Publisher.*

This well-known handbook is indispensable as an official record of the geography and statistics of Jamaica.

Spanish West Indies—Porto Rico. **Sievers.**
M.G. Ges. Hamburg, 1891-92 (1895): 217–236.
Zur Kenntniss Puerto Rico's. Von Prof. Dr. Wilhelm Sievers. *With Map.*

Argentine Republic. *B.A. Nac. Córdoba* 14 (1894): 21–54. **Bodenbender.**
La llanura al Este de la sierra de Córdoba. Contribución á la historia del desarrollo de la llanura pampeana. Por Guillermo Bodenbender.

Argentine Republic. *Rev. Museo La Plata* 6 (1894): 1-24. **Valentin.**
Rapido estudio sobre las Sierras de los Partidos de Olavarria y del Azul (Provincia de Buenos Aires). Por el Dr. Juan Valentin. *With Plates.*

Argentine Republic—Cordoba. *B.A. Nac. Córdoba* 14 (1894): 55–92. **Doering.**
La insolacion en Córdoba. Resultados correspondientes al quinquenio 1889-1893. Por Oscar Doering.
Sunshine records at Cordoba.

Bolivia. *Rev. Museo La Plata* 6 (1894): 141-219. **Pando.**
Viaje á la Región de la Goma Elastica (N. O. de Bolivia). Por José Manuel Pando. *With Map.*

Bolivia—Titicaca. *Deutsche G. Blätter* 18 (1895): 100-109. **Copeland.**
Ein Besuch auf der Insel Titicaca. Von Dr. R. Copeland.

British Guiana. **Perkins.**
Notes on British Guiana and its Gold Industry. By H. I. Perkins. January 8, 1895. London: Waterlow & Sons, 1895. Size 13½ × 8½, pp. 24. *Maps and Charts. Price* 1*s. Presented by Messrs. Waterlow & Sons.*

A systematic description of the gold regions of British Guiana, with large-scale maps of the gold districts, showing routes of approach and workings. A brief general description of the colony is prefixed to the more complete description of the special regions. Some useful information for the benefit of intending miners is added.

British Guiana—Roraima. *Timehri* 8 (N.S.) (1894): 297–315. **Schomburgk.**
Richard Schomburgk's Account of Roraima. Translated by Mrs. M. H. von Ziegezar.

Central America—Nicaragua. *Petermann's M.* 41 (1895): 57–66. **Mierisch.**
Eine Reise quer durch Nicaragua, vom Managua See bis nach Cabo Gracias á Dios. Ausgeführt im Jahre, 1893. Von Dr. Bruno Mierisch. *With Map.*

AUSTRALASIA AND PACIFIC ISLANDS.

Australasia. **Coghlan.**
A Statistical Account of the Seven Colonies of Australasia. By T. A. Coghlan. With Map and Diagrams. Sydney: Charles Potter, and E. A. Petherick & Co., 1894. Size 8½ × 5½, pp. 454. *Presented by the Agent-General for New South Wales.*

A new and revised edition.

Australasia. *Nature* 52 (1895): 20-23. **Gregory.**
The Geological Development of Australia. By the Hon. A. C. Gregory.

British New Guinea. *Scottish G. Mag.* 11 (1895): 161-180. **MacGregor.**
British New Guinea. By Sir William MacGregor.

British New Guinea. *J. R. Colonial I.* 26 (1894-95) 1895: 294–325. **Macgregor.**
British New Guinea. By Sir William Macgregor.

The heads treated of this paper are Administration, Legislation, and the Task of the Government.

British New Guinea. **Haddon.**
The Decorative Art of British New Guinea: a Study in Papuan Ethnography. By Alfred C. Haddon. With twelve plates. (Royal Irish Academy. 'Cunningham Memoirs.'—No. X.) Dublin, 1894. Size 13 × 10, pp. 280. *Price* 14*s. Presented by the Royal Irish Academy.*

This fine memoir is handsomely illustrated. Professor Haddon strongly urges the importance of undertaking a careful study of the anthropology of New Guinea and the Pacific Islands, and points out that if this work is to be done at all it must be done soon.

Chatham Islands. *J. Polynesian S.* 3 (1894): 187-198. **Shand.**
The Moriori People of the Chatham Islands: their traditions and history. By Alexander Shand. *With Plate.*

Fiji. *M. G. Ges. Wien* 38 (1895): 1–25. ———
Sclaverei auf den Fiji-Inseln.

Anonymous criticism on the government of Fiji.

Hawaii—Gravity. *American J.S.* 49 (1895): 271-272. **Preston.**
Disturbances in the direction of the Plumb-line in the Hawaiian Islands. By E. D. Preston. *With Map.*

Hawaii—Rainfall. *Meteorologische Z.* 12 (1895): 1–14. **Hann.**
Der Regenfall auf den Hawaii-Inseln. Von J. Hann.

Lord Howe Island. *Petermanns M.* 41 (1895): 72–77. **Vollmer.**
Lord Howe-Insel, Pitcairn und Norfolk-Insel. Von Dr. A. Vollmer.

New Guinea. **Chalmers.**
Pioneer Life and Work in New Guinea, 1877–1894. By James Chalmers. London: the Religious Tract Society, 1895. Size 8 × 5, pp. 256. *Portrait, Map, and Illustrations. Price* 3*s.* 6*d. Presented by the Religious Tract Society.*

This little volume contains reprints of some of Mr. Chalmers' early papers, and, in addition, a considerable amount of new material, showing the same clear insight into native life which has always characterized his accounts of his missionary journeys.

New Zealand. **Buller.**

Illustrations of Darwinism, and other papers. By Sir Walter L. Buller. From *Transactions of the New Zealand Institute*, vol. xxvii. Wellington: S. Costall, 1895. Size 8½ × 5½, pp. [82]. *Plate. Presented by the Author.*

These papers deal with the natural history of New Zealand, and include photographs of the curious "vegetable caterpillar."

Timor. *Tijds. Ned. Aard. Genoots. Amsterdam* (2) 11 (1894): 541, 659, 765. **Ten Kate.**

Verslag eener reis in de Timorgroep en Polynesië. Door Dr. Herman F. C. Ten Kate. *With Map.*

POLAR REGIONS.

Antarctic and Arctic. **Markham.**

Arctic and Antarctic Exploration. By Clements R. Markham, C B. [In the third Annual Report of the Council of the Liverpool Geographical Society, for year ending December 31, 1894, pp. 25–48.] Size 8¼ × 5½.

Antarctic Exploration. **Petersen.**

Die Reisen des "Jason" und der "Hertha" in das Antarktische Meer 1893–94, und die wissenschaftlichen Ergebnisse dieser Reisen, von Dr. Johannes Petersen, nebst einer Originalkarte des Dirck Gherritz-Archipels mit Begleitworten von L. Friederichsen. Separatabdruck aus den Mittheilungen der Geographischen Gesellschaft in Hamburg, 1891-92, Heft ii. Hamburg: L. Friederichsen & Co., 1895. Size 9 × 6, pp. 62. *Presented by Herr Ludwig Friederichsen.*

A full account of the expeditions already referred to in the *Journal*, and of value in correcting errors which had been made in the hurried translation of the abstract log published in vol. iv. (1894), p. 333 *et seq.* Many of these errors were obviously due to the handwriting of the original abstract.

Bering Strait. *Deutsche G. Blätter* 18 (1895): 109-125. **Hegemann.**

Die Witterungs-, Eis- und Strömungsverhältnisse des Beringsmeeres, der Beringstrasse und des nördlich von letzterer belegenen Eismeeres. Von Kapitän Fr. Hegemann.

Greenland. *G. Tidskrift* 13 (1895–96): 37–47. **Bruun.**

Den arkæologiske Expedition til Julianehaabs Distrikt, 1894. Ved Premierløjtnant i Todfolket Daniel Bruun.

Greenland. *B. American G.S.* 26 (1894): 447–488. **Peary.**

The Cape York Ironstone. By R. E. Peary.

A note in the Monthly Record gives particulars of Mr. Peary's discovery of the source of the meteoric iron of Cape York, first reported by Sir John Ross.

Polar Exploration. **Morris.**

The Problem of the Pole. By Charles Morris. From the *New Science Review*, July, 1894. Size 10 × 6½, pp. 59–76.

Spitzbergen. *Alpine J.* 17 (1895): 297–309. **Conway.**

Spitzbergen. By W. M. Conway.

A general summary of our knowledge of Spitzbergen.

Spitzbergen. *Alpine J.* 17 (1895): 309–316. **Gatty.**

Ice Fiord, Spitzbergen. By Victor H. Gatty. *With Sketch-Map and Two Illustrations.*

Notes of the pleasure-trip of the *Lusitania* to Spitzbergen in August, 1894.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Botanical Geography. **Schulz.**

Grundzüge einer Entwicklungsgeschichte der Pflanzenwelt Mitteleuropas seit dem Ausgange der Tertiärzeit. Von Dr. August Schulz. Jena: G. Fischer, 1894. Size 9½ × 6½, pp. 208. *Price* 6 *m.*

Geodesy—Length of Degree. *Deutsche G. Blätter* 18 (1895): 64–75. **Börgen.**

Ueber die Ausführung einer Gradmessung im hohen Norden. Von Dr. C. Börgen.

Supporting the proposal for exact measurements of the value of the degree in high northern latitudes, either in East Greenland or in Spitzbergen.

Geographical Tables. **Woodward.**

Smithsonian Miscellaneous Collections, 854. Smithsonian Geographical Tables. Prepared by R. S. Woodward. Washington: the Smithsonian Institution, 1894. Size 9½ × 6½, pp. cv. and 182. *Presented by the Smithsonian Institution.*

These valuable tables are an enlargement of the geographical section of Guyot's Meteorological Tables. The first part deals with Useful formulas, Mensuration, Units, Geodesy, Astronomy, Theory of Errors, and Explanation and Source of Tables. The second part contains tables for the most important geographical calculations in measurement and map-construction.

Land and Sea. **Wagner.**

On the areas of the Land and Water of the Globe. A new calculation by zones of ten degrees of latitude. By Professor Hermann Wagner. From the *Scottish Geographical Magazine* 11 (1895): 185–189. *Presented by the Author.*

This will be specially noticed.

Latitude Changes. *C.R.* **120** (1895): 592–595. **Gonnessiat.**

Sur les variations des latitudes terrestres. Note de M. F. Gonnessiat.

The observations described were made at the Observatory of Lyons.

Map-projections. **Fiorini.**

Prof. Matteo Fiorini. Sopra una speciale trasformazione delle projezioni cartografiche atta alla delineazione dei Mappamondi Roma, 1895. Size 9 × 6, pp. 14. *Presented by the Author.*

Meteorology. *B. S. Languedoc G.* **17** (1894): 24–35, 132–186. **Duponchel.**

La circulation des vents et de la pluie. Par M. Duponchel.

Mountains. *Nat. Science* **6** (1895): 240–243. **Marr.**

Forms of Mountains. By J. E. Marr.

Oceanography—Areometer. *Ann. Hydrographie* 22 (1894): 415–427. **Krümmel.**

Ueber einige neuere Beobachtungen an Aräometern. Von Prof. Dr. O. Krümmel in Kiel.

Oceanography—Areometer. *Rev. Maritime et Colon.* **124** (1895): 696–707. **Thoulet.**

De l'utilité de la mesure des densités en océanographie et d'un nouveau modèle d'aréomètre à eau de mer. Par M. J. Thoulet.

Oceanography—Currents. *Ann. G.* **4** (1895): 257–270. **Thoulet.**

Quelques considérations générales sur l'étude des courants marins. Par M. Thoulet.

Oceanography—Refractometer. *Ann. Hydrographie* **22** (1894): 241–249. **Krümmel.**

Das Doppelbild-Refraktometer zur Bestimmung des Specifischen Gewichts des Seewassers auf optischem Wege. Von Prof. Dr. O. Krümmel in Kiel. *With Illustrations.*

This valuable oceanographical instrument has already been noticed in the *Journal*, vol. iv. (1894), p. 570.

Oceanography—Soundings. ———

Soundings taken by the India Rubber, Gutta Percha, and Telegraph Works Company, Limited, 1890–1893. Central and South American Cables Expedition, 1890–91. Central and South American Duplicate Cables Expedition, 1893. Size 8½ × 5½, pp. 18.

Ditto, 1889–1894. Third West African Expedition, 1889. Western and Brazilian Cables Expedition, 1891. Off the coast of Brazil, and on Voyage home, 1884. Brazilian and African Cables Expedition, 1891. South American Cable Company's Expedition, 1892. South American Cable Repairs, 1893. Ceuta-Gomera Cable Expedition, 1894. Size 8½ × 5½, pp. 28. *Presented by the Company.*

Photographic Surveying. *Rev. Maritime et Colon.* **124** (1895): 579–594. **Lancelin.**

De l'utilisation en hydrographie des clichés photographiques obtenus au moyen d'appareils à main. Par M. Lancelin.

Photographic Surveying. *C.R.* **120** (1895): 651–653. **Thoulet.**
Sur une application de la Photographie à l'océanographie. Note de M. J. Thoulet.

Professor Thoulet proposes to map shifting sandbanks which are partially exposed at low water, by photographing the bank from a height at different phases of tide, so securing a series of contour-lines at any desired closeness of vertical interval.

Physical Geography. **Shaler.**
Sea and Land. Features of Coasts and Oceans, with special reference to the Life of Man. By N. S. Shaler. London: Smith, Elder & Co., 1895. Size 9½ × 6½, pp. xiv. and 252. *Illustrations. Price* 10*s.* 6*d.*

A collection of magazine articles and abstracts of Geological Survey memoirs, put together with the object of introducing "unprofessional students of nature to certain interesting phenomena of the sea-shore and of the depths of the ocean." This it seems well fitted to effect. The chapters are entitled respectively Sea and Land, Sea-Beaches, The Depths of the Sea, Icebergs, Harbours and Civilization, The Formation and Preservation of Harbours, Tidal Currents and Organic Life in Harbours.

Physical Geography. **Klein.**
Jahrbuch der Astronomie und Geophysik. Enthaltend die wichtigsten Fortschritte auf den Gebieten der Astrophysik, Meteorologie und physikalischen Erdkunde, Unter Mitwirkung von Fachmännern herausgegeben von Dr. Hermann J. Klein. V. Jahrgang 1894. Leipzig: E. H. Mayer, 1895. Size 9 × 6, pp. x. and 352. *Map and Plates.*

GENERAL.

Bibliography. **Baschin.**
Bibliotheca Geographica herausgegeben von der Gesellschaft für Erdkunde zu Berlin bearbeitet von Otto Baschin unter mitwirkung von Dr. Ernst Wagner. Band I. Jahrgang 1891 und 1892. Berlin: W. H. Kühl, 1895. Size 9½ × 6, pp. xvi. and 506.

Special notice of this bibliography will be given.

Biography—Baker. **Murray and White.**
Sir Samuel Baker, a Memoir. By T. Douglas Murray and A. Silva White. London: Macmillan & Co., 1895. Size 9 × 6, pp. xii. and 448. *Portrait, Maps, and Illustrations. Price* 21*s. Presented by the Publishers.*

This is noticed on p. 73.

Biography—Dana. *American J. Science* (3 S.) **49** (1895): 329–356. ——
James Dwight Dana. *With Portrait.*

Biography—Empress Leonora. **Cordeiro.**
Portuguezes fóra de Portugal. Uma Sobrinha do Infante Imperatriz da Allemanha e Rainha da Hungria por Luciano Cordeiro. Lisboa: Imprensa Nacional, 1894. Size 10 × 6½, pp. 222.

Biography—Franklin. **Smith.**
Sir John Franklin and the Romance of the North-West Passage. By G. Barnett Smith. London: S. W. Partridge & Co., [1895]. Size 7½ × 5, pp. 160. *Price* 1*s.* 6*d. Presented by the Publishers.*

A popular account of Franklin's life and work appearing appropriately at the commemoration of his last voyage, on which he started fifty years ago.

Biography—Ismail Pasha. ——
Société Khédiviale de Géographie. Hommage à la mémoire de S. A. le Khédive Ismail Pacha, fondateur de la Société. Séance solennelle du mars 1895. Cairo, 1895. Size 9½ × 6½, pp. [44]. *Portrait.*

Biography—Pâris. *C.R.* **120** (1895): 473–484. **Guyon.**
Notice sur la vie et les travaux de M. l'amiral Pâris. . . . Par M. E. Guyon.

Biography—Pouchet. *Rev. Scientifique* (4) **3** (1895): 258–261. **Retterer.**
Biographies scientifiques. Georges Pouchet. Par M. Ed. Retterer.

Biography—Rennell. **Markham.**
The Century Science Series. Major James Rennell and the Rise of Modern English Geography. By Clements R. Markham, C.B., etc. London: Cassell & Co., 1895. Size 7½ × 5, pp. 232. *Portrait. Price* 3*s.* 6*d. Presented by the Publishers.*

Starting with the dictum that Major Rennell was the first and greatest of English geographers, Mr. Markham traces the training and development of the geographical powers of the subject of his memoir, and shows how the present position of geography in this country is a direct outcome of Rennell's influence.

Biography—Vasco da Gama. **Cordeiro.**

Sociedade de Geographia de Lisboa. Descobertas e Descobridores. De como e quando foi feito conde Vasco da Gama. Memoria apresentada á 10ª sessão do Congresso Internacional dos Orientalistas por Luciano Cordeiro. Lisboa: Imprensa Nacional, 1892. Size 10 × 6½, pp. 54. *Facsimiles.*

Biography—Walker. ——

Days of a Soldier's Life. Being letters written by the late General Sir C. P. Beauchamp Walker, K.C.B., during active service in the Crimean, Chinese, Austro-Prussian (66), and Franco-German (70–71) Wars. With Portrait. London: Chapman and Hall, 1894. Size 9 × 6, pp. 412. *Price* 18*s.*

The late Sir Beauchamp Walker, of whom this volume is practically the autobiography, was for many years a member of the Council of the Royal Geographical Society, and the Foreign Secretary of the Society.

Biography—Weinek. *Deutsche Rundschau G.* 17 (1895): 325–327. ——

Professor Dr. L. Weinek. *With Portrait.*

Biography—Xántus. *Deutsche Rundschau G.* 17 (1895): 327–330. **Palóczy.**

Johann Xántus. By Prof. L. Palóczy. *With Portrait.*

Book of Reference—Spanish Academy. ——

Anuario de la Real Academia de Ciencias Exactas, Fisicas y Naturales, 1895. Madrid: Imp. de L. Agnado. Size 4½ × 3½, pp. 288.

Book of Reference—Statesman's Year-Book. **Keltie and Renwick.**

The Statesman's Year-Book. Statistical and Historical Annual of the States of the World for the year 1895. Edited by J. Scott Keltie with the assistance of I. P. A. Renwick. Thirty-Second Annual Publication. London: Macmillan & Co., 1895. Size 7½ × 5, pp. xxxii. and 1156. *Price* 10*s.* 6*d.* *Presented by the Author.*

The thirty-second annual publication of this indispensable year-book contains, in addition to the statistics of all nations, a new series of Tables, giving particulars of the value of silver from 1858 to 1894, the wheat crops of the World, the navies of the World, the World's shipping, the railways of Europe, and the British empire.

Bremen Geographical Society. *Deutsche G. Blätter* 18 (1895): 5–11. **Lindeman.**

25 Lebensjahre der geographischen Gesellschaft in Bremen. Von Dr. M. Lindeman.

British Empire. **Paul.**

A short view of Greater Britain: showing the date of acquisition of the various British Dependencies, with their relative grouping and geographical distribution, so as to illustrate the progressive Colonial Expansion of the Empire. By Arthur Paul. London: Sonnenschein & Co., 1895. Size 14 × 11. *Price* 1*s.*

A diagram in one sheet.

British Trade. **Whitehead.**

The Critical Position of British Trade with Oriental Countries. By T. H. Whitehead. A paper read before the Royal Colonial Institute, February 12, 1895. Size 8½ × 5½, pp. 44. *Presented by the Author.*

The effect of the depreciation of silver, the competition of native labour in India, and the development of manufactures in Japan are discussed in their bearing on British trade in the East.

Cartographical Exhibition. ——

Katalog einer Mercator-Ausstellung im Lesesaale der Kölner Stadtbibliothek, Portalsgasse 1. Cologne, 1894. Size 10 × 6½, pp. 10.

Coast-Photography. *Ann. Hydrographie* 22 (1894): 340–343. **Talbot.**

Photographische Küstenaufnahmen. Von Robert Talbot. *With Illustrations.*

Hints on the taking of useful photographs from a ship of the coast.

Commercial Geography—Meat Supply. *J.S. Arts* 43 (1895): 420–429. **Nelson.**
The Meat Supply of the United Kingdom. By E. Montague Nelson.

A history of the trade in live animals and dead meat, with statistics of its growth and present condition.

Geographical Society of Geneva. **Claparède.**
Rapport sur la marche et l'activité de la Société de Géographie de Genève pendant l'exercice 1893–1894. Lu à l'ouverture de la XXXVII^{me} session annuelle de la Société le vendredi 16 novembre 1894. Par Arthur de Claparède, Président. Geneva: Imp. Aubert-Schuchardt, 1895. Size 9½ × 6, pp. 30. *Presented by the Author.*

Geography—General. *B.G. Club Philadelphia* 1 (1894–95): 85-120. **Heilprin.**
The Progress of Discovery and the Lands of Promise to the Explorer. By Prof. Angelo Heilprin.

The Geographical Club of Philadelphia now issues a well-arranged bulletin, the first number of which for the current session contains the address of the President of the Club.

German Colonies. **Meinecke.**
Koloniales Jahrbuch. Beiträge und Mittheilungen aus dem Gebiete der Kolonialwissenschaft und Kolonialpraxis. Herausgegeben von Gustav Meinecke. Achter Jahrgang. Heft 1–2. Berlin: Carl Heymanns Verlag, 1895. Size 9½ × 6½, pp. 160. *Portrait.*

German Colonies. ———
Weissbuch. Vierzehnter und Fünfzehnter Theile. Berlin: Carl Heymanns Verlag, 1895. Size 12 × 8½, pp. 206 and 156.

Part 14 contains reports on the protectorate of South-West Africa, including a long paper by Dr. Hindorf on its economic value, and on the Marshall islands. Part 15 contains numerous reports on German East Africa, and also short reports on the Cameroons and Togo-land.

Historical—Sea-Charts. **Wagner.**
XI^{ter} Deutscher Geographentag in Bremen 1895. Leitfaden durch den Entwickelungsgang der Seekarten, vom XIII.-XVIII. Jahrhundert oder bis zur allgemeinen Einführung der Mercatorprojektion und der Breitenminute als Seemeile. An der Hand der Ausstellung 1895 dargestellt von Hermann Wagner. Bremen: Druck von Carl Schünemann. Size 9 × 6, pp. 36. *Presented by the Author.*

Prospector's Handbook. **Anderson.**
The Prospector's Handbook. A Guide for the Prospector and Traveller in search of metal-bearing or other valuable minerals. By J. W. Anderson. Sixth Edition. London: Crosby Lockwood and Son, 1895. Size 7 × 5, pp. xii. and 176. *Illustrations. Presented by the Author.*

The present edition has been revised, and is printed and bound in a manner adapting it for ready reference in the field.

Travels in America and Asia. **Stanley.**
My Early Travels and Adventures in America and Asia. By Henry M. Stanley, D.C.L. 2 vols. London: Sampson Low and Co., 1895. Size 8 × 5½, pp. (vol. i.) xxii. and 302; (vol. ii.) x. and 424. *Maps and Portraits. Price* 12*s.* 6*d. Presented by the Publishers.*

The first volume of this intensely interesting work contains an account of Mr. Stanley's early adventures with the Indians of the Western States, during the operations of the United States troops during 1867. The second volume contains an account of travels in Asia during 1869 and 1870, before the search for Livingstone, containing an account of the opening of the Suez Canal, a visit to Philæ, Jerusalem, and a journey from Constantinople, across by Tiflis, to Baku, and thence to and through Persia.

NEW MAPS.

By J. Coles, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Ordnance Survey.**
Publications issued since May 8, 1895.

1-inch—General Maps:—
ENGLAND AND WALES:—164, engraved in outline, 1*s.*

6-inch—County Maps :—

England and Wales :—**Lancashire,** 48 N.W., 50 N.E., 52 S.E., 53 N.W., S.E., 56 N.W., N.E., 57 N.E., 61 N.W., 118 N.W. **Yorkshire,** 9 S W., 20 S.W., 31 N.W., 32 N.E., 33 S.W., 43 N.E., 46 S.W., S.E., 47 N.W., S.E., 59 S.W., S.E., 60 S.E., 61 N.W., N.E., 70 S.E., 71 N.E., S.E., 72 N.E., S.W., S.E., 73 N.W., N.E., S.E., 74 N.E., 77 S.E., 78 N.W., 87 S.E., 88 N.E., S.E., 89 S.W., 90 N.W., N.E., 104 N.E., 138 S.W., S.E., 139 S.W., S.E., 155 N.W., 156 S.W., 172 S.W., S.E., 173 N.W., N.E., S.W., 185 S.W., 189 N.W., 202 N.E., S.E., 216 N.E., 271 S.E., 1*s.* each.

25-inch—Parish Maps :—

England and Wales :—**Yorkshire,** VIA. 12, 3*s.*; VIB. 16, 11*s.* 6*d.* (coloured).

Town Plans—5-feet scale :—

London—Re-survey, IV. 32; VI. 40. 47, 57, 58, 67, 96, 99, 100; VIII. 43, 76; X. 1, 5, 11, 12, 14, 21, 44, 45, 57, 2*s.* 6*d.* each.

——— 10-feet scale :—

Hornsey, II. **50,** 4, 2*s.* 6*d.*; III. **52,** 1, 2*s.* 6*d.*

(*E. Stanford, Agent.*)

Germany. **K. Kanal-Kommission in Kiel.**

Officielle Karte vom Nord-Ostsee-Kanal bearbeitet von der Kaiserlichen Kanal-Kommission in Kiel. Scale 1 : 100,000 or 1·7 stat. mile to an inch. Verlag von Max Pasch, Berlin. *Presented by R. H. Porter, Esq.*

The fact that the opening of the canal connecting the North and Baltic Seas is at the present time attracting a great deal of attention, invests this map with a certain amount of interest. It is evidently taken from the German Government map on the scale of 1 : 100,000, on which the canal has been laid down. At the foot of the map sections are given showing the depth of the canal, and the elevation of the adjacent land.

Scotland. **Johnston.**

W. and A. K. Johnston's "Three Miles to Inch" Map of Scotland. Scale 1 : 190,080 or 3 miles to 1 inch. W. & A. K. Johnston, Edinburgh and London, 1895. Sheet 6. *Price of each sheet,* 1*s. unmounted;* 1*s.* 6*d. mounted. Presented by the Publishers.*

This is the first sheet that has appeared of a series of reductions from the Ordnance Survey of Scotland, on the scale of three miles to an inch. It is printed in colours, contour-lines, names of hills and main roads in brown, water in blue, and parks in green. The map is very neatly drawn, and when completed the series will consist of fifteen sheets.

ASIA.

Siam. **Morant.**

Siam and her Neighbours. Scale 1 : 3,000,000 or 47·3 stat. miles to an inch. Edited and compiled from the best and most authentic sources by Robt. L. Morant, M.A. Oxford, Tutor to H.R.H. the Crown Prince. Drawn and executed under the immediate supervision of Lieut. de Richlieu of H.S.M.'s Survey Department, Bangkok. *Presented by Robt. L. Morant, Esq., M.A.*

This map which has been completed by Mr. R. L. Morant for the use of schools in Siam has been lithographed by Mr. F. S. Weller in three different styles. The first shows only the rivers and boundaries, in the second hills are added, and the third is a complete general map with the names of places in Siamese characters. The bold style in which these maps have been produced is well suited to the purpose for which they have been published.

Tabriz. **Tabriz Military College.**

Plan of Tabriz, from surveys by pupils of the Military College at Tabriz in 1880. Published 1894. Scale (approx.) 1 : 8,820 or 7·2 stat. miles to an inch. Persian characters. *Presented by General A. Houtum-Schindler.*

The surveys from which this map has been made were carried out by the Persian students of the Military College of Tabriz, under the direction of Mirza Ghias Khan, chief of the college, and the draughtsman's work was done by Muhammed Reza Khan. The map is a very good specimen of cartography.

AFRICA.

Algeria. **Service Géographique de l'Armée, Paris.**

Carte de l'Algérie. Scale 1 : 50,000 or 1·26 inch to a stat. mile. Service Géographique de l'Armée, Paris. Sheets Nos. 37, Cap Ténès; 59, Ténès; 72, Radjas Ferada; 108, Pont du Kaïd. *Price 1 fr. 50 c. each sheet.*

North-East Africa. **Chaurand.**

Carta dimostrativa della Etiopia. Compilata dal Capitano di Stato Maggiore Enrico de Chaurand. Scale 1 : 1,000,000 or 15·7 stat. miles to an inch. Laboratorio foto-litografico del Ministero della Guerra. 7 sheets. *Price of complete map,* 13 *lire. Presented by the Comando del Corpo di Stato Maggiore, Roma.*

With the publication of these sheets, this map is complete. Great pains have been taken in the compilation, and it is the best general map of the country it includes, that has been published.

AMERICA.

Guatemala. **Sapper.**

Kartenskizze der Vulkane in West-Guatemala. Von Dr. Carl Sapper. Petermann's 'Geographische Mitteilungen,' 1895. Tafel 7. Justus Perthes, Gotha. *Presented by the Publisher.*

South America. **Delachaux.**

Übersichtskarte des Erdbebens vom 27 Okt. 1894, in Süd-Amerika. Nach einer Skizze von Enrique Delachaux. Scale 1 : 7,500,000 or 118 stat. miles to an inch. Petermann's 'Geographische Mitteilungen,' Jahrgang 1895. Tafel 8. Justus Perthes, Gotha. *Presented by the Publisher.*

GENERAL.

The World. **Saint Martin and Schrader.**

Atlas universel de géographie construit d'après les sources originales et les documents les plus récents cartes, voyages, mémoires, travaux géodésiques, etc., avec un texte analytique. Ouvrage commencé par M. Vivien de Saint-Martin et continué Fr. Schrader. No. 58, Afrique en 3 feuilles Feuille N. O. Paris: Librairie Hachette et Cie., 1895. *Price* 2 *fr. each sheet.*

This is another sheet of what promised to be one of the best atlases ever published, but such a length of time has elapsed since it was commenced, that many of the maps which have previously appeared are out of date. This is the more to be regretted as they are, like the present sheet, beautifully executed.

The World. **"The Times."**

The Times Atlas. Complete in fifteen weekly parts. Published at the *Times* Office, London. Parts 6, 7, 8, 9. *Price* 1*s.* each part. *Presented by the Publishers.*

The present issues of this atlas contain the following maps:—Part No. 6—Africa South of the Equator, Denmark, Alsace-Lorraine and the Palatine of Bavaria, France General (double page), United States Western and North-Eastern. Part No. 7—Palestine, Asia Minor and Persia, British Isles (double page), British North America (double page), Polynesian Groups, South Polar Regions, New Guinea and Papuan Archipelago. Part No. 8—South America (double page), Hungary, Bohemia, Moravia and Austrian Silesia, Italy General (double page), Canada Eastern and Western. Part No. 9—Africa General (double page), Central America and West Indies, the Antilles, Kingdom of Saxony, Thuringian States, Italy North, Ethnographic Map of the Balkan Peninsula, Constantinople, and the Sea of Marmora. In addition to the principal maps, numerous insets are given.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, March and April, 1895. *Presented by the Hydrographic Department, Admiralty.*

No.	Inches.	
2352 m	= 0·97	France, west coast:—Presqu' île de Quiberon to anse de Benodet. 2*s.* 6*d.*
2428 m	= 1·48	Balearic islands, Majorca:—Dragonera island to Carril bay, including Palma bay. 2*s.* 6*d.*
2063 m	= 4·0	Mediterranean:—Malta island, northern portion. 3*s.* 6*d.*
2623 m	= 4·0	Malta:—Comino channels. 1*s.* 6*d.*
335 m	= 5·94	Plans on the north coast of South America:—Carenero harbour. 1*s.* 6*d.*
2417 m m	= 0·97 = 2·00	Central America:—Columbia bay, Mandinga harbour. 1*s.* 6*d.*
535 m	= 0·53	Brazil:—San Marcos or Maranham bay and approaches. 2*s.* 6*d.*

2346 m = various. Plans on the coast of Chile:—Lantaro cove, Tames bay, Coloso cove, Colorado cove. 1s. 6d.
1357 m = 0·12 Africa, west coast:—River Benin to river Cameroon, including the mouths of the river Kwara or Niger. 2s. 6d.
701 m = 1·2 Madagascar, north-west coast:—Bombetoke bay, and delta of the Betsiboka river. 2s. 6d.
675 m = 12·0 Red sea:—Trinkitat harbour. 1s. 6d.
866 m = various. Plans on the west coast of Sumatra:—Simalafeh and Siberut bays, Bunga bay, Hurlock bay, Siuban bay, Kawur or Sambat bay, Semebaai bay, Pulo Pisang harbour, and Kroé road. 1s. 6d.
2465 m = various. Plans of anchorages in Serwatti and Tenimber islands:—Rumah Kuda bay and Nusa Mitan, Babar strait, Tepa road, Batu Merah anchorage, Nika anchorage, Wattewah road, Ritabel bay, Wailutu road, Sabiani anchorage, Egeron strait. 1s. 6d.
1371 m = 0·42 China sea:—Anamba islands. 2s. 6d.
2099 m = 0·73 Borneo:—North-western part of Sibuko bay. 2s. 6d.
507 m = 0·93 Japan:—Go yo mai channel to Yezo strait, including Nemoro, Notsuke, and Tomari anchorages. 2s. 6d.
995 m = 2·9 Japan:—Susaki harbour and Nomi ura. 1s. 6d.
2601 m = 0·5 Solomon Islands, New Georgia:—Wana wana to Mbulo island. 2s. 6d.
1871 Ports Surbi and Mijella:—Plan added: port Vathudi.
1734 St. Julien island to Hooping harbour:—Plan added: Silver cove.
912 Anchorages in islands off the north-west part of New Guinea:—Plans added: Saonek anchorage, Moreha road.
1269 Saïgon or Don-nai river:—New plan: Coral bank in Saïgon river.
259 Fusan harbour, etc.:—New plan: Commemoration bay.
2405 Kuril islands from Nipon to Kamchatka:—Plans added: Tokolan bay, Rubetsu bay.
2128 Plans of the Kuril islands:—Plans added: Moyoro bay, Paramushiru strait, Kuril strait and Paramushiru strait.

(*J. D. Potter, Agent.*)

Charts Cancelled.

No.		Cancelled by	No.
344	Port of Tarragona.	New Chart. Port of Tarragona	344
330	Lake and river St. Clair.	New Chart. Lake and river St. Clair, with the Detroit river	330
1297	San Andres bay.	New Chart. Plans on the coast of Chile . . .	1296
1317	Port Otway.		
1338	Vallenar road.		
563	Port St. Domingo.		
564	Piti Palena inlet.		
1296	Low, Melinka, and Inner ports.		
575	Port Huasco.	New Chart. Plans on the coast of Chile . . .	1302
578	Arica road.		
1302	Port Caldera and Yugles, Port Flamenco, Pan de Azúcar anchorage, Lavata bay.		
1315	Port Copiapó, Pajonal cove, Herradura de Carrizal, Chañeral de las Animas bay, Totoralillo bay.		
2760	Plan of Tabujong road on this sheet.	New Plan. Tabujong road on sheet	855
934	Beliling road (part of plan of Beliling and Sangit roads) on this sheet.	New Plan of Buleleng road on same sheet	934
2415	Nagasaki harbour.	New Chart. Nagasaki harbour	2415

628 Plan of Kwoibo river on this sheet.

2623 Comino channels.	New Chart. Comino channels	2623
396 Plan of Candelaria bay on this sheet.	New Chart. Columbia bay, Mandinga harbour	2417
535 San Marcos or Maranham bay.	New Chart. San Marcos or Maranham bay and approaches	535
1357 Cape Formoso to Fernando Po.	New Chart. River Benin to river Cameroon	1357
701 Bembatooka bay.	New Chart. Bombetoke bay, and delta of the Betsiboka river.	701
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Charts that have received Important Corrections.

No. 2268, England, south coast:—Portland harbour. 2255, England, south coast:—Weymouth and Portland. 2393, England, west coast:—Milford haven. 1772, Ireland, south coast:—Approaches to Wexford harbour. 2295, Norway, west coast:—Trondhjem bay. 2842B, Baltic sea. 2372, Baltic:—Liban to Lyserört. 2373, Baltic:—Gulf of Riga. 2263, Baltic:—Entrance to gulf of Riga. 2692, North America, east coast:—Louisburg harbour. 2806, North America, east coast:—Charleston harbour. 1523, Ports and anchorages on the north coast of South America. 1301, Plans on the coast of Chile. 586, South America, west coast:—Guayaquil river. 2885, North America, west coast:—San Diego bay, Santo Tomas anchorage. 580, Vancouver island:—Strait of Georgia, sheet 2. 579, Vancouver island:—Strait of Georgia, sheet 1. 1003, Africa, east coast:—River Pungue. 2737, India, west coast:—Viziadrug to Cochin. 2760, Sumatra, west coast:—Acheh head to Tyingkok bay. 2761, Sumatra, west coast:—Tyingkok bay to the strait of Sunda. 1964, China, east coast:—Mirs bay. 1199, China, east coast:—Kueshan islands to the Yang tse kiang. 1256, China, north-east coast:—Pe chili and Liau tung gulfs. 532, Japan:—Simonoseki strait. 452, Japan:—Yezo island. 107, Japan:—Matoya harbour. 2354, Australia, north-east coast:—Cape Grenville to Booby island. 2919, Australia, north-east coast:—Cape Grenville to cape York. 2920, Australia, north-east coast:—Cape Direction to Cape Grenville. A. to P. Index Charts, sixteen sheets. 2061, White sea:—Approaches to Kem. 2298, Gulf of Bothnia:—Sheet iii., Nystad light to Stor Fiärd. 870, Gulf of Finland:—Wormsö sound. 1229, Africa, west coast:—Sauta Cruz to cape Bojador. 283, Newfoundland:—Codroy road to Cow Head harbour. 2775, 2777 to 2787, River St. Lawrence:—Quebec to Montreal (these twelve charts have been corrected and reissued, and the number of Sheet xiii. has been altered to 2788). 19, South America, east coast:—Santos harbour. 1499, Alaska:—Cross sound to Kadiak island. 1500, Aleutian islands:—Kadiak island to Siguam island. 1421, Africa, east

coast:—River Chinde. 648, Africa, east coast:—Delagoa bay to river Zambezi. 358, Japan:—The western coasts of Kiusiu and Nipon, including the Korea strait. 992, Japan:—Akishi bay. 83, Japan:—Channels between Misima nada and Iyo nada. 2405, Russian Tartary:—Kuril islands from Nipon to Kamchatka. 1430, Russian Tartary:—Slavianski bay (port Bruce). 2650, Russian Tartary:—Strait of Tartary and the entrance of the Amur river.
J. D. Potter, agent.

Pilot Charts. **U.S. Hydrographic O**

Pilot Charts of the North Atlantic for April and May, 1895, and North Pacific Oceans for April, May, and June, 1895. Published monthly at the Hydrographic Office, Washington, D.C., Charles D. Sigsbee, Commander U.S. Navy, Hydrographer. *Presented by the U.S. Hydrographic Office.*

Red Sea. **Meteorological O**

Meteorological Charts of the Red Sea. Published by the Authority of the Meteorological Council, London. Printed for Her Majesty's Stationery Office, by Eyre & Spottiswoode, 1895. *Price* £1 1*s*. *Presented by the Meteorological Office.*

This atlas contains a series of meteorological charts of the Red Sea. The twelve sheets show the winds, barometer, and air-temperature for each month of year, with explanatory notes; and remaining sheets are devoted to currents, spe gravity, and sea-temperature for each month. The charts have been constru from information furnished by Her Majesty's ships, the logs of the Peninsular Oriental Steam Navigation Company, and from observations supplied by the R Meteorological Institute of the Netherlands. Very few observations have l obtained prior to the opening of the Suez Canal in 1869, and nearly all material wl has been used is from steamships which follow much the same track within narrow limits.

PHOTOGRAPHS.

Central Asia. **Hanb**

Album containing 75 photographs of Eastern Turkestan and the Taghdumbash Pamir, taken by David T. Hanbury, Esq., in 1893. *Presented by David T. Hanbury, Esq.*

This album contains a very interesting set of photographs illustrating the scei and dwellings of Eastern Turkestan and the Taghdumbash Pamir. There are al large number of photographs which will be of special interest to sportsmen, suc Turki natives hunting with trained golden eagles, heads of Ovis Poli rams, spor trophies, etc. Considering the difficult circumstances under which these photogra were taken, they are remarkably good.

Himalayas. **Whiteho**

Eight Photographs of the Himalayas of Garhwal and Kumaon (Nandi Devi District), taken by Lieut. B. Whitehouse, R.N., in October, 1894. *Presented by Lieut. B. Whitehouse, R.N.*

These are excellent specimens of amateur photography, and have been well ch to illustrate the scenery and physical features of Garhwal and Kumaon.

Tibet, etc. **Rock**

121 Photographs of Western China, Tibet, etc., taken by W. W. Rockhill, E in 1892. *Presented by W. W. Rockhill, Esq.*

This series of photographs, which were taken by Mr. W. W. Rockhill during travels in 1892, in Western China and Tibet, form a valuable addition to Society's collection, as illustrating scenery and incidents of a journey through a re which has seldom been visited by Europeans.

N.B.—It would greatly add to the value of the collection of Ph graphs which has been established in the Map Room, if all the Fell of the Society who have taken photographs during their travels, wo forward copies of them to the Map Curator, by whom they will acknowledged. Should the donor have purchased the photographs will be useful for reference if the name of the photographer and address are given.

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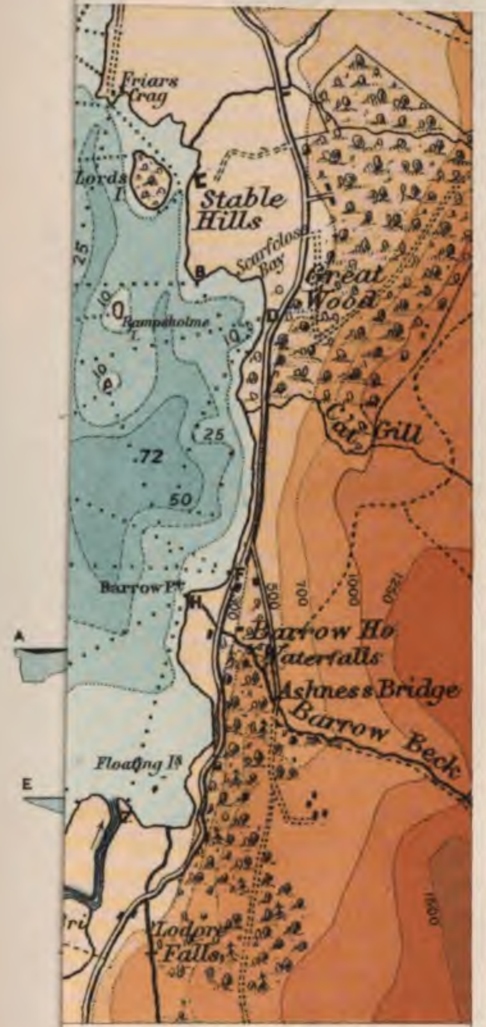

ERWENT WATER

SOUNDINGS BY
ert Mill, D.Sc., and Edward Heawood, M.A.,
June 1893.

and Contours from the Ordnance Survey.
rface of Water above Sea Level 244 Ft. (74·5 Metres).

31,680
I MILE
·31 KILOMETRE
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1·61 Kilometres

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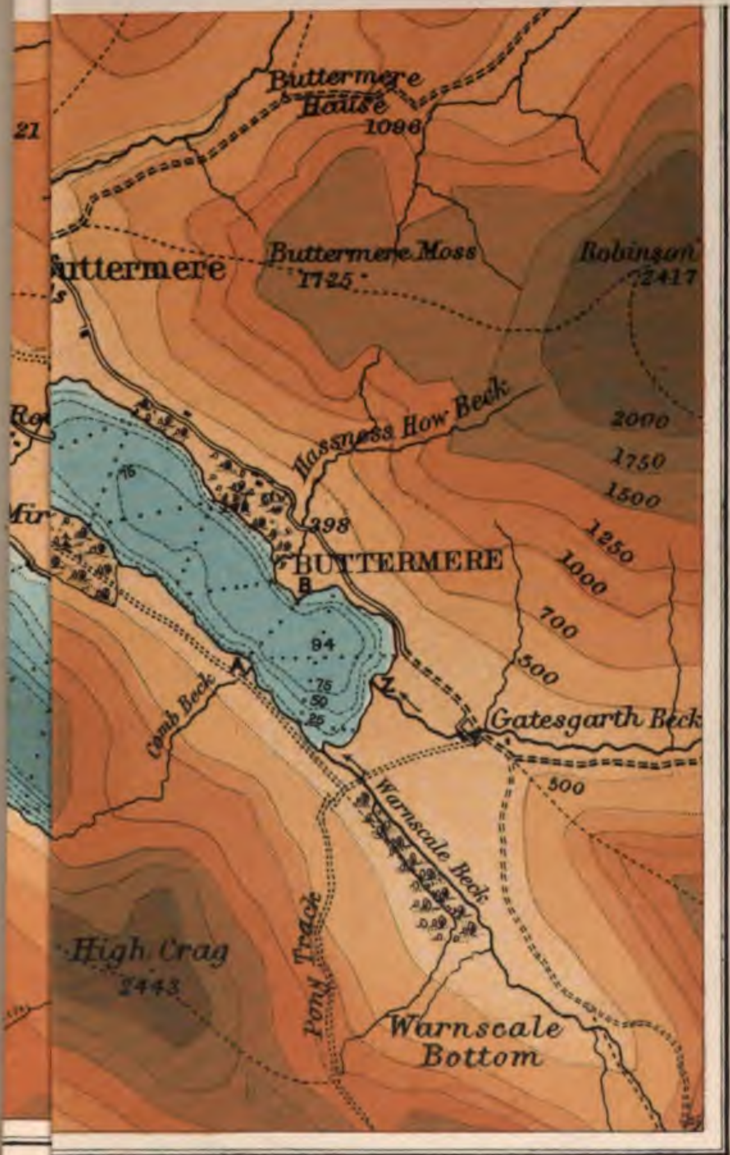

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Geographical Journal.

No. 2. AUGUST, 1895. Vol. VI.

EXPLORATION OF THE FRANKINCENSE COUNTRY, SOUTHERN ARABIA.*

By J. THEODORE BENT.

In revisiting the south-east of Arabia this winter, our hopes were to get from Muskat to the seat of our former work in the Hadramut, and to fill up the large vacuum in the map which this country offers. Experience has now taught us that this is impracticable, but that Arabia must be done piecemeal, and then patched together as it were; and, indeed, this is the most profitable way of doing any country, for the traveller on a great through journey generally loses the most interesting details. Probably no country in the habitable world is at present so little known as Arabia. Arab fanaticism, waterless wastes, piracy and brigandage, have all combined to exclude Europeans, and now that we know so much of the history of Greece, Egypt, Palestine, and other Oriental countries from monumental records, Arabia is about the only place left that will afford us new and startling discoveries in the study of primitive mankind.

Taking South Arabia from the east, we may rapidly enumerate the work that has been done. In Oman we have the journeys of Palgrave, Wellsted, and Colonel Miles; along the coast-line a few people have landed here and there, notably Dr. Carter and Colonel Miles, who both visited the coast of Dhofar, but no one has gone inland as far as the hills. Herr Hirsch and we ourselves penetrated into the Hadramut last year. Mr. Tate, Colonel Wahab, and Mr. Harrington have made dives into Yemen and the Yafi country, and, of course, around Aden the country is now pretty well known. Dr. Glaser has made some interesting archæological excursions to Sana, Marib, and other parts of northern

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* Paper read at the Royal Geographical Society, June 6, 1895. Map, p. 204.

Yemen, Professor Schweinfurth and a few others have also visited Yemen, and Mr. Walter Harris also has made a journey from Aden to Sana, but with these exceptions the rest of South Arabia remains to be done. This evening I propose to describe the portion we have reclaimed this winter from the unknown, and relate our journeyings to and from Dhofar.

We reached Muskat on December 6 last, and there, with the kind assistance of Major Hayes Sadler, prepared to make our plans. We learnt that Oman proper might easily be surveyed at a time when the bellicose tribes in the interior are in a state of comparative tranquillity; to the west of Oman proper, there are several tribes of independent and hostile character, only nominally under the sway of the Sultan of Oman. Of these I may mention the Jenefa tribe, noted for slave-trading and looting shipwrecked vessels; they are naturally much opposed to the visits of Europeans, lest their sources of livelihood should be imperilled, but if the traveller can secure his *kafeer*, or paid escort, from these chiefs, there is every likelihood that he would pass safely through their territories. West of the Jenefa tribe stretches the vast desert of Oman, which connects the arid wastes of Central Arabia directly with the Indian Ocean, and the crossing of which entails hardships which even the Arabs themselves are loath to encounter.

IN MUSKAT HARBOUR.

The most interesting feature in Oman is the Jebel Akhdar, or Green Mountain, which, with its ramifications, occupies the whole of the central district of this country, and rises to a height of over 8000 feet, and in the winter-time is very cold, and subject, we were told, to falls of snow. At the foot of this mountain is Nezweh, the old capital of Oman, and we heard reports concerning the grapes which grow there and the wine they make, and that it was the original home of the muscatel grape. We then proposed to pass through the Jenefa tribe to Ghubbet el Hashish on the west, and entirely abandon the desert route as impracticable for Europeans. To arrange for this journey, the Sultan of Muskat and Major Sadler took infinite trouble; camels were hired, and a horse for Mrs. Bent, and the sheikhs of the various tribes through which we should pass were summoned to escort us. Owing, however, to the illness of some of our party, we were at the last moment obliged to leave the expedition for another season, and, as events proved, it was fortunate we did so, for the insurrection broke out almost immediately afterwards, and in all probability we should not have returned alive to relate our experiences.

Before entering upon a description of the Dhofar district, which formed the principal part of our winter's work in Arabia, a few words may not be amiss on the present condition of Oman, as it has lately been the scene of considerable local agitation. Muskat, the capital and seat of government, has many points about it which remind one of Aden. It has a good harbour, and is surrounded by arid volcanic mountains. It bears the same relation to the Persian Gulf that Aden does to the Red Sea, and it is now practically British as far as the environments of the town are concerned, and the Sultan occupies much the same position as the native independent princes do in India. If it were not for British protection, and the presence of our gunboat in the harbour, Sultan Feysul, the present ruler, would have long ago succumbed to the attacks of the chiefs from the interior, and the ambitious projects of his brother Mohammed. Though on paper the territory of Oman is exceedingly large, extending to the north as far as the Turkish limits beyond Bereymi, and to the west beyond the confines of the great desert, including Dhofar, a distance of over 700 miles, nevertheless the authority of the present Sultan is almost entirely confined to the two towns of Muskat and Mattra, and the small strips of fertility immediately contiguous to these places. His great-grandfather, Sultan Seyid Said, was a man of considerable power, but on his death Zanzibar was separated from Muskat, and Sultan Toweyni's power was much circumscribed by the ambitions of his nephew Tourki, who ultimately succeeded in getting his uncle assassinated, and in ascending the throne under British protection; his son Feysul now reigns in continual dread of the machinations of his immediate relations. He and his half-brother Mohammed never meet without an escort to protect them from each other, and under this state of affairs the power and audacity of the Bedouin chiefs outside Muskat have increased to an alarming extent, and this has been the cause of the recent disturbances.

The present dynasty has been on the throne since 1741, when the Said family rose from obscurity, and the founder of the dynasty was elected Imam by popular acclamation; he shook off the Persian yoke, and established Oman as a power in the East. His son, Said bin Ahmed, was the last of the elected Imams. The Imam, as head of the Church and army in Oman, had to take an oath to fight against all infidels, but the next heir protested that this position was too expensive to maintain, so the Imamate, or spiritual lordship of Oman, has been in abeyance ever since. The result of this course of action has been a great laxity of religious opinion in Oman, fostered also by their natural antagonism to their fanatical neighbours, the Wahabi, who occupied the country and oppressed the inhabitants for a brief period at the commencement of this century. Nowhere in Arabia is Mohammedanism so lax as it is in Oman, offering a striking contrast to the bigotry of the people of the Hadramut, amongst whom our lot was thrown the previous winter.

The Omani form a third sect, as distinct from the Sonnites and Shiites, amongst whom the rest of the Muslim world is divided, and are known as the Ibadhiyah sect, or the followers of Abdullah bin Ibadh, who lived in the years 685–705 after the Hegira. The Sonnites recognize four successors of Mohammed as Imams—namely, Abubekr, Oman, Othman, and Ali. The Shiites reject all but Ali and his family, whereas the Ibadhiyites recognize none of these, but say that an Imam, if required, must be elected by the voice of the faithful. In Muskat one may enter the mosques without let or hindrance, and wretched neglected buildings they are, with only an apology for a minaret in one corner, about three feet high like an inverted bell. The chief buildings of Muskat are of Portuguese origin—namely, the two forts at either extremity of the town, and the ruined cathedral, which is now used as a stable for the Sultan's horses. Muskat has but few architectural attractions, a few carved balconies and doors, a few palaces, notably those of the Sultan and grand-vizier, and its aspect is one of squalor and dirt; few more unhealthy places could be found in the world. The narrow, dirty streets are the hotbed of disease, fostered by the moist heat to which it is subject. Just outside the walls by the fish-market is a malarious pond, into which the inhabitants throw their dead fish and other refuse, and the mephitic vapours from this, when the wind is from that quarter, spread fever broadcast through the town.

At the time when piracy was rife in the Persian Gulf Muskat was a great trade centre, but the overthrow of piracy and the introduction of steam has reduced Muskat to its normal condition, namely, that of a date-exporting harbour; nevertheless its strategical position and harbour will always ensure it a certain amount of trade and importance. The population of Muskat is strangely cosmopolitan for an Arab town. The merchants are chiefly Banyans from India and Persians; outside the town, in numerous encampments of reed huts, dwell colonies of Belouchis from the Mekran coast, African negroes from Zanzibar and Somaliland, and Bedouins from the mountains, by whom all the active labour of the town is carried on, whereas the Omani Arab is essentially lazy, and does as little for his livelihood as he can. Mattra, the commercial centre, from which all the roads to the interior start, is about

3 miles from Muskat round a headland; the journey thither is chiefly performed by water, the camel-track taking a long round through the mountains to get there. There is another road used in rough weather, partly by water, and then across a pass at the back of the headland. The scenery around Muskat is particularly fantastic and weird, but absolutely arid and unproductive, except where a few gardens are maintained by irrigation. The fishing village of Sadad is built on an inlet of the sea 4 miles south of Muskat, and the view over this, with its palm gardens belonging to Said Yusuf, and its fantastic background of tossed and tumbled volcanic peaks, intermingled with inlets of the sea, is one of the most striking I have ever seen. The coast-line, too, is very fine, with its beetling cliffs of black and green tufa rocks, the home of countless sea-birds. In one of the retired bays near Muskat, approachable only by sea, is the European cemetery, in which secluded retirement lie buried many men from the British gunboats, and the missionary Bishop French, who is probably the only man who has ventured to make an attack on the religion of Southern Arabia.

SADAD, NEAR MUSKAT.

Dhofar, the ancient frankincense country, at which point we elected to commence our winter's campaign, is 640 miles by sea from Muskat; this distance we were prepared to traverse in a boat lent us by the Sultan, called a *bateel*, rather smaller than a dhow, when luckily one of the Turkish pilgrim steamers on its way to Jeddah put into Muskat, and the captain consented to drop us for a consideration at Mirbat, the first point of Dhofar, where the desert ends. Thus we were saved an uncomfortable sail of doubtful duration along an inhospitable coast, where the inhabitants are few, and celebrated for their marauding tendency.

Dhofar is nominally under the Sultan of Muskat. I may here emphatically state that the southern coast of Arabia has absolutely nothing to do with Turkey, and from Muskat to Aden there is not a single tribe paying tribute or having any communication with the Ottoman Porte.

Eighteen years ago the inhabitants of Dhofar were in such a state of internal turmoil, and in such dread of the Bedouins of the Gara tribe, that they applied to Sultan Turki for a ruler. He sent them Wali Suleiman, a man of remarkable strength of character and determination, who has gained for himself a great reputation for bravery amongst the neighbouring Bedouin tribe, who all respect him and his authority. Suleiman was the son of a slave of Sultan Toweyni, and a most intimate friend and adherent of Sultan Turki, whom he greatly assisted in coming to the throne of Oman. He had only a hundred Arab soldiers with him when he reached Dhofar, but his skill was such and his powers of organization so efficient, that he defeated the Bedouins in several encounters, and now he boasts that he has twelve thousand Bedouins devoted to him, and told us with pride that two years ago he had sent two thousand rupees as tribute to Muskat, last year he had only sent one thousand, and that this year he had sent none. His next step will probably be, when a favourable opportunity offers, to declare himself independent under British protection. For this reason he was exceedingly polite to us, entertained us in his castle by the coast at Al Hafa during our stay, and arranged with the greatest possible assiduity for our safety during our exploration of the interior.

Dhofar and the Gara mountains which encircle it form a quite abnormal feature in this otherwise arid coast. From Cape or Ras Risut on the west to Mirbat on the east we here find a long narrow stretch of flat alluvial soil at the foot of the mountains, very little raised above the level of the sea. This plain is never more than 9 miles wide, and at the eastern end, where the mountains come down nearer to the sea, it is reduced to an exceedingly narrow strip. Water is here very near the surface. Streams making their way to the sea are of constant occurrence; consequently the plain is very fertile, and capable of producing almost anything. Along the whole line are many groves of coconut palms. Tobacco, cotton, Indian corn, and various species of grain grow here in great abundance; in the gardens we find many of the products of India flourishing, namely, the plantain, the papya, mulberries, melons, chilis, brinjoles, and fruits and vegetables of various descriptions. In fact, Dhofar and the Gara mountains may be termed one large oasis by the sea, bounded on the north by the Nejd desert, on the east by the Oman desert, and the gradual tendency to the west is towards the arid hills and sand-choked valleys which we met in the Hadramut last year. As we shall presently see, the Gara mountains are full of water, forming itself here and there into small lakes. They are decked to their summits with rich vegetation, and this will account for the fertility of the plain of Dhofar, and the strange contrast it forms to the rest of the coast-line of Arabia.

The one drawback to the progress of this country is its harbourless condition. During the north-east monsoons dhows can find shelter at

Mirbat, and during the south-west monsoons at Risut, but the rest of the coast-line is provided with nothing but open roadsteads with a rough surf always rolling in from the Indian Ocean, and we had considerable difficulty in landing ourselves and our goods at Al Hafa in small hide-covered boats specially constructed for riding over this surf.

We traversed the whole of this plain between Capes Risut and Mirbat in various directions, and found thereon the sites of ruined towns of considerable extent in no less than seven different points, though at the two capes where now is the only anchorage there are no ruins to be seen, proving, as we afterwards verified for ourselves, that anchorage of a superior nature existed here in antiquity, and which has since become silted up, but which anciently must have afforded ample protection for the boats which came here in the frankincense trade. At Takha, as we shall presently see, there was a very extensive and deep harbour, running a considerable distance inland, which with a little outlay of capital could easily be restored.

COAST SCENERY WEST OF DHOFAR.

After a close examination of these ruined sites, there can be no doubt that those at spots called now Al Balad and Robat, about 2 miles east of the Wali's residence, formed the ancient capital of this district. We visited them last Christmas Day, and were much struck with their extent. The chief ruins are by the sea, around an acropolis some 100 feet in height. This part of the town was encircled by a moat still full of water, and in the centre, still connected with the sea, but almost silted up, is a tiny harbour. The ground is covered with the remains of Mohammedan mosques, and still more ancient Sabæan temples, the architecture of which—namely, the square columns with flutings at the four corners, and the step-like capitals—at once connects them architecturally with the columns at Adulis on the Red Sea, those of Koloe and Aksum in Abyssinia, and those described by M. Arnaud at Mariaba in Yemen. In some cases these are elaborately decorated with intricate patterns, one of which is formed by the old Sabæan letters ⊙ and which may possibly have some religious import. After seeing the rui at Adulis and Koloe, the numerous temples or tombs with four isolate columns, no doubt can be entertained that the same people built the all. As at Adulis and Koloe, there is unfortunately an absence o epigraphy which would materially assist us, but the subsequent Mohammedan occupation and the conversion of the temples into mosques ma account for this.

This town by the sea is connected by a series of ruins with anothe town 2 miles inland, now called Robat, where the ground for many acre is covered with ancient remains; big cisterns and water-courses are her cut in the rock, and standing columns of the same architectural feature are seen in every direction.

With the aid of Sprenger's 'Alte geographie Arabiens,' the best guide book the traveller can take into this country, there is no difficulty i identifying this ancient capital of the frankincense country as th Μαντεῖον 'Αρτέμιδος of Claudius Ptolemy. This name is obviously Greek translation of the Sabæan for some well-known oracle whic anciently existed here, not far, as Ptolemy himself tells us, from Cap Risout. This name eventually became Zufar, from which the moder name of Dhofar is derived. In A.D. 618 this town was destroyed an Mansura built, under which name the capital was known in earl Mohammedan times. Various Arab geographers also assist us in thi identification. Yakut, for example, tells us how the Prince of Zufa had the monopoly of the frankincense trade, and punished with deat any infringement of it. Ibn Batuta says that "half a day's journe east of Mansura is Alahkaf, the abode of the Addites," probably referring to the site of the oracle and the last stronghold of the ancient cult

Claudius Ptolemy is certainly very clear in his geography of thi coast. East of the Hadramut is the promontory of Syagros (Ra Fartak), and east of Syagros, on the Sachalites Sinus, first is mentione the city of Manteion Artemidos (Μαντεῖον 'Αρτέμιδος), and then Abyssapolis ('Αβυσσάπολις). Between this last-mentioned town and Rasa Hadd (Cape Coradamus), a long distance then as now of desert coast, h gives us no name. Sprenger sums up the evidence by saying that th town of Zufar and the later Mansura must undoubtedly be the ruin of Al Balad. He also associates Abyssapolis with Mirbat, and the existing evidence, as we have seen, quite confirms this statement. Thu having assured ourselves of the locality of the ancient capital of th frankincense country—for no other site along the plain has ruins whic will at all compare in extent and appearance with those of Al Balad—we shall, as we proceed on our journey, find that other sites fall easil into their proper places, and an important verification of ancien geography and an old-world centre of commerce has been obtained.

Wali Suleiman gave us of the best he had to offer, and placed th best rooms of his castle at our disposal. The residences of the Arabs in Dhofar will not compare with those of the Hadramut, which surprised us so much last year. Wali Suleiman constructed his own when he came to the country, equi-distant from a cluster of villages which contain the chief Arab population of the plain. It is strong and substantial, and stands in an isolated position close by the coast; a fine gateway leads into a long dark passage, lined on either side by stone benches, where the Wali's soldiers recline, and where sheikhs from the mountains are regaled with coffee out of a huge coffee-pot with a long bird-like beak when they come to visit him. This passage leads into a spacious courtyard with a well in it, near which dwells the white she-ass, Wali Suleiman's only steed, on which he pays his state visits to the various villages in his dominions. Also there are here kept a considerable number of state prisoners, Beduins convicted of rapine, and Mahris captured in war. They are all bound with iron fetters, and the worst characters are chained to blocks of wood. Every night these prisoners said their prayers in a corner, led by an imprisoned mollah, and bewailed their misdeeds into the small hours of the night. This fact alone attests to Wali Suleiman's power over his neighbours. We never saw such a sight as this amongst the Hadramut sultans.

Wali Suleiman's ordnance is not of a high order; his soldiers mostly fight with the antiquated matchlock guns, and a few rusty old cannons stand near the doorway; but these are sufficient to overawe the Beduins, who have but little in the way of firearms. Outside the castle there is a large enclosure or bazaar, where the frankincense trade is carried on, and there is also a long palm-thatched shed which serves as a sort of parliament-house, where the chiefs who visit the Wali sit during the day, and a fire is always burning there to provide these guests with coffee. Almost directly you leave the castle you step into cultivated land extending in every direction for miles, and dotted with cocoanut groves around the villages, the houses in which are plain but substantial, being mostly built of stones brought from the ruins. The mosques here, as in Oman, are most insignificant, and the inhabitants do not appear to be the least fanatical.

After a few days' delay at Al Hafa, under the hospitable roof of Wali Suleiman, our arrangements for an expedition into the interior were made. To secure our safety, the Wali had summoned seventeen sheikhs or heads of families of the Gara tribe, who own the mountainous district behind the plain up to the confines of the Nejd desert, and in accordance with his summons they all arrived, bringing with them their camels with which to convey our party and our luggage. The whole convoy was placed under the guidance of one sheikh, Sayel, an old grey-haired, wiry man, dressed in nothing but a loin-cloth, but the possessor of so great wealth in flocks and herds that all the others treated him with great respect, and termed him the sheikh of all the

Garas. He owns seventy camels, worth 500 rupees apiece, and cows, sheep, and goats innumerable.

We never had to deal with wilder men in our lives than those who constituted our escort; they wore long unkempt hair, tied down with a leather thong like a boot-lace. Each man carried his wooden shield called a *gohb*, so constructed with a knob that he could turn it round and use it as a stool to sit upon; his wooden spear pointed at both ends, called *ghatrif*, a weapon peculiar to the Gara tribe, which they hurl with wonderful precision; and his flat iron sword called *saif*. Very few also carried matchlock guns. We found these wild men in most respects friendly during our wanderings, but of most independent spirit. If we asked them to do anything for us, they would reply, "We are sheikhs, not slaves;" and when once away from the influence of Wali Suleiman, they paid no heed to the orders of the soldiers sent by him, and during the time we were with them we had the unpleasant feeling that we were entirely in their power. They would not march longer than they liked; they would only take us where they wished, and they were unpleasantly familiar; with difficulty we kept them out of our tents, and if we asked them not to sing at night and disturb our rest, they always set to work with greater vigour. They got hold of our Christian names, and were for ever using them, to our great annoyance. They affected indifference for money, and absolutely the only hold we had over them was medicine; they positively loved my medicine-chest, and during our journey consumed an incredible quantity of pills, quinine, and other dainties. At first they would chew the pills, with disastrous results, but we soon taught them to swallow them in the orthodox fashion. Every night we had a row of them wanting to be doctored, and with this feeble weapon we ruled. Certainly they did well by us on the whole, and eventually we were satisfied that they took us to see everything in their country, but at first we doubted them greatly. They would chat pleasantly with us as we went along, but were ready at the slightest provocation to fly into wild incoherent rages, and the information they gave us about the country was never twice the same. Altogether the Garas are different in character and physique to any natives I have met elsewhere; in type they are akin to the Hadramut Beduin, small, active, and with finely cut features, but they are much wilder and less accustomed to contact with civilization. They live chiefly in caves and under trees, only using reed huts when they come down to the plain to encamp with their flocks during the rains.

Not a whit less wild than their masters are the camels of the Gara; they danced about like antelopes, and made hideous noises when loaded, and we had the greatest difficulty in getting our goods fastened on to them. The Beduins were totally ignorant of camel-loading; they brought no ropes or thongs, a supply of which we were luckily able to obtain from the Wali, and during the first days of our journey most of our baggage was thrown off and damaged, and it became quite a common sight to see a camel scampering away across the plain in terror, dragging its fallen load over rocks and through thorns. In the Hadramut we were surprised to see the camels eating fish; here in Dhofar we were still more surprised to find them consuming bones with avidity, and if they saw a bone on the side of the track, no power of ours would prevent them from stepping aside and appropriating it. As for the riding camels, they too were painfully wild, and we all in our turns had serious falls, and counted ourselves lucky that no bones were broken. The fertile highlands of the Gara country are celebrated for breeding camels, but they do not use them themselves except for bringing frankincense to the coast, as there is no trade route or communication with the interior through their country. These were our chief difficulties in travelling through the Gara country, but as we had no fear for our personal safety and the attacks of hostile tribes, we felt infinitely happier than in the Hadramut.

We left Al Hafa on December 30 last, and our first day's march took us close to Cape Risut, past several ancient ruined towns of minor importance. Near Cape Risut a large tract of country is covered with frankincense trees, with their bright green leaves like ash trees, their small green flowers, and their insignificant fruit. The frankincense, the old staple trade of this district, is still gathered in three places in the Gara mountains. The best is obtained at spots called Hoye and Haski, about four days' journey inland from Mirbat, where the Gara mountains slope down into the Nejd desert. The second in quality comes from near Cape Risut, and also a little further west, at a place called Chiseri, frankincense of a marketable quality is obtained, but that further west in the Mahri country is not collected now, being much inferior. The best quality they call *leban lakt*, and the second quality *leban resimi*, and about 9000 cwt. are exported yearly and sent to Bombay. It is only collected in the hot weather, before the rains begin, in the months of March, April, and May, for during the rains the tracks on the Gara mountains are impassable. They cut the stem, and after seven days return to collect the gum which has exuded; this they do three or four times a month, and in the cool weather, as the gum comes but slowly, they leave the trees alone. The trees belong to the various families of the Gara tribe; each tree is marked and known to its owner, and the product is sold wholesale to Banyan merchants, who come to Dhofar just before the monsoons to take it away.

One could not but feel interested in the existence still of this old-world trade on the very spot which was once so celebrated for it, when the odoriferous gum was much more prized for temple-worship and household consumption than it is now; and as we rode through the groves of this incense-bearing shrub we thought of the cunning old-world legends of the dragons which were supposed to guard these trees, and of the death-giving odours which they were believed to exhale; for the old Sabæan frankincense merchants were jealous guardians of their treasures, and sought by awe-inspiring anecdotes to keep off competition.

LAKE IN THE WADI GHERSID, DHOFAR.

From Cape Risut we went inland to the base of the mountain range, and spent several days in visiting lovely little gorges, which run a short way into the mountains; but there is no approach by them to the heights above, the wall of rock being here abrupt and impassable. They are lovely ideal little spots, with running streams and ferns and trees, bulrushes, reeds, and tropical vegetation. Beduin families live in the caves around, finding here ample fodder for their cattle. We originally understood that Sheikh Sayel was going to take us up to the mountains by a valley still further west, but for some reason, which we shall never know, he refused; some said the Mahri tribe was giving trouble in this direction, others that the road was too difficult for camels. At any rate, we had partially to retrace our steps, and following along the foot of the mountains, found ourselves encamped not so many miles away from Al Hafa.

The next day we entered the mountains by the Wadi Ghersid, the regular Gara track between the coast and the interior; the entrance to this gorge is about 9 miles from the Wali's castle, and on entering it a great surprise was in store for us. Instead of the sand-choked valleys of the Hadramut, arid except where irrigation is carried on with immense labour, we here were plunged into a valley covered with the richest tropical vegetation. Just above our camp, on the second day, water coming out of three holes in the mountain-side forms itself into a small and exquisitely beautiful lake, well stocked with duck and other water-birds, photographs of which we took; the encircling rocks are overhung with creepers, and covered with maidenhair and other ferns; huge fig-trees block up the valley, the lower branches of which are full of *débris*, showing how in the rainy season this gorge must be a raging torrent; limes, cactus, aloe, and mimosa form on all sides a delightful forest, whilst the mountains rising above the lake are clad almost to the summit with timber. Such a scene as this we never expected to witness in Arabia; it reminded us more of the rich valleys leading up to the tableland of Abyssinia, and never shall we forget the delightful evening spent by the lake of Ghersid. It is doubtless probable that a knowledge of such valleys as these gained for Arabia its ancient reputation for floral wealth. Passages in Theophrastus, Strabo, Athenæus, allude to this, and more especially to its wealth in aromatic plants. Aristotle calls Arabia εὐώδης, sweet-smelling, and Pliny more especially gives us a list of the trees and herbs grown in Arabia, and it is highly likely that the frankincense merchants who visited Dhofar in pursuit of their trade knew of these valleys, and not unnaturally brought home glowing accounts of their fertility, and gained for Arabia a reputation which has been thought to be exaggerated.

Next day we pursued our way up the gorge of Ghersid, climbing higher and higher, making our way through dense woods, often dangerous for the camel-riders, and obliging us frequently to dismount; sweet-scented white jessamine hung in garlands from the trees, and the air was fragrant with the odour of many flowers; above us towered grey rocks, and the hill-slopes were clad on both sides with trees.

We had one more camp in this lovely valley, almost at its head, where it is very narrow, and then on the following morning we commenced the ascent up a rugged path exceedingly difficult for the camels. The highest point of this range of mountains is not more than 3000 feet, and at our camp that night we registered 2600 feet. From above the aspect of this country is very curious. On the side towards the sea the mountains are cut by several deep gorges, similar to the Wadi Ghersid, full of vegetation, and all the hills around up to the summit are covered with grass and clusters of trees; as it was the dry season, this grass was converted into hay, which no one cared to harvest. Here and there in the brown expanse were isolated groups of fig-trees, of which we counted three varieties, and the thick foliage of these trees was full of birds; these groups of trees give a very park-like aspect to the country, and dotted over it we saw numerous herds of camels, goats, and cows grazing, which belonged to the Garas. We constantly came across their homesteads, which consisted of deep caves in the hillside, in which the families and the flocks live together in happy union; the calves and kids are penned in holes in the rocks, the milk is churned by shaking it in a skin attached to a tripod, and all their implements are of the rudest kind.*

We found the Gara women exceedingly shy and retiring—so different from the bold hussies in the Hadramut, who tormented us with staring into our tent; they fled, if we approached them, like timid gazelles. They have but poor jewelry—silver necklaces, armlets, and nose and toe rings; they love to join their eyebrows with antimony, and stick some black sticky stuff like cobbler's wax over their noses and foreheads; they are very small, and like Japanese; they do not cover their faces, and are very lightly clad in dark blue homespun cotton garments.

After proceeding along these highlands for two days, we decided to halt for two nights, nominally for a rest, as we had now been on the march for many consecutive days; but there came on the most frightful hurricane from the north, which blew steadily for two days and nights, and effectually prevented us from getting the rest we required. Our tents were with difficulty kept erect, and the cold was very trying. Our Beduins lay in an inert mass round wood fires, and our whole camp was for the time being thoroughly miserable.

From this point, however, we were able to take excellent observations around us, and form a clear idea of the configuration of the Gara range. The oasis-like nature of this range is here very marked; in all directions beyond it is desert. As it slopes down to the north it gradually becomes more and more arid, vegetation becomes more and more sparse, until it ends altogether in the yellow desert of Nejd, stretching as far as the eye could reach, and ending in the horizon in a straight blue line as if it was the sea. Sheikh Sayel promised to take us across the Gara border into Nejd if we wished; but as it would have entailed a considerable delay and parley with the sheikhs of the Nejd Beduins, and as we could see from our present vantage ground that the country would afford us absolutely no objects of interest, we decided not to attempt this expedition.

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* It is interesting to read in the 'Periplus,' § 32, a description of this coast, and of the high mountains behind, "where men dwell in holes."

On leaving our very exposed and nameless camping-ground, we pursued our course in a north-east direction, still passing through the same park-like scenery, through acres and acres of lovely hay worth nothing a ton. It is exceedingly slippery, and dangerous foothold for the camels; consequently numerous falls were the result, and much of our journey had to be done on foot.

On the second day we began again to descend down a hideous road, and a drop of about 1500 feet brought us to a remarkable cave just above the plain, and only about 10 or 12 miles from Al Hafa. This cave burrows far into the mountain-side, and is curiously hung with stalactites, and containing the deserted huts of a Beduin village, only inhabited during the rains. Immediately below this cave in the Wadi Nefas are the ruins of an extensive Sabæan town, in the centre of which is a natural hole 150 feet deep and about 50 in diameter; around this hole are the remains of walls, and the columns of a large entrance gate. We asked for information about this place, but all we could get in reply was that it was the well of the Addites, the name always associated with the ruins of the bygone race. In my opinion this spot is the site of the oracle mentioned by Ptolemy and others, from which the capital of Dhofar took its name. It much resembles the deep natural holes we found in Cilicia in Asia Minor, where the oracles of the Corycian and Olbian Zeus were situated. It is just below the great cave I have mentioned, and, as a remarkable natural phenomenon, it must have been looked upon with awe in ancient days, and it was a seat of worship, as the ruined walls and gateway prove; furthermore, it is just half a day's journey east of the city of Mansura or Zufar, where, Ibn Batuta somewhat contemptuously says, "is Al Akhaf, the abode of the Addites," and there is no other point on the plain of Dhofar where the oracle could satisfactorily be located from existing evidence. Sometime, perhaps, an enterprising archæologist may be able to open the ruins about here, and verify the identification from epigraphical evidence.

From this point we rode across the plain for about ten miles to the coast, at a place called Rizat, and were entertained for the night by Wali Suleiman, at a house he has built here, some 12 miles west of his permanent home at Al Hafa; but as his accommodation here is limited, we remained in our tents. Here he has utilized a running stream to fertilize several acres of ground, in which he grows tobacco, sugar-cane, jowari, and various other products; his garden is well stocked with fruit and vegetables, and is delightfully shady, and we enjoyed a rest under a mulberry tree after our hot ride, and ate quantities of the small fruit. Wali Suleiman spends much of his time here, getting away from his troubles both domestic and political.

From Rizat to Takha is an uninteresting ride of 13 miles along the plain, past the mouths of several streams with plenty of water, clear but brackish, and with dense growth of mangrove down by the sea.

At Takha are extensive remains of an ancient town, which must have been second only in importance to the capital at Al Balad; similar columns, only without decoration, are standing here and there, marking the sites of tombs and temples, and we passed by several large stone sarcophagi and other remains. As the mountains come down here very near to the sea, the position is considerably more attractive, and the modern village is one of the largest of those scattered over the plain of Dhofar.

It at once occurred to us that this must be the site of the town which is alluded to by Claudius Ptolemy and Arrian as Ἀβυσσάπολις. Yakut tells us (iv. 481) "it is the harbour for the town Zufar, and is distant five parasangs from it. The harbour is good, and is often mentioned by traders, whereas the town Zufar has only a roadstead but no harbour." Ibm Khaldun, in his geographical account of the countries beyond Yemen, says, "Zufar was the seat of empire of the Tubbas, and Mirbat was situated on the seashore; both cities are now in ruins." Again, Bunbury, in his work on ancient geography, says, "The port of Moscha, which appears to have been a place of considerable trade, must probably have been situated in the district now known as Dhofar, a little to the west of the modern town Mirbat." Dr. Glaser, in his Arabian Geography, says, "If the Moscha of the Periplus must be sought for about 10 miles west of Mirbat, then I have no hesitation in saying that it must be identified with Abissa Polis and Tafa."

These accounts, if they at first sight offer a little discrepancy, can on inspection be easily reconciled. The ruins of Takha are exactly as Yakut says, 5 parasangs or 20 miles west of those of Zufar at Al Balad, and as there are none at the modern town of Mirbat, and only indifferent anchorage during the north-west monsoons, it would suggest itself that the Mirbat of antiquity was situated here.

On the following day this somewhat puzzling question was settled for us by finding the only thing wanted to identify the spot, namely, a commodious harbour. An hour's walk from our camp near Takha took us across a promontory where the estuary of a river forms quite a large lake, separated from the sea only by a narrow sand-belt over which the water flows at high tide. Around this lake are the ruins of several ancient buildings, and what is now a headland connected to the mainland by a neck of sand is surrounded by an ancient wall and fortification, and bears the appearance of once being an island protecting the entrance to a harbour. The similarity to some of the ancient Greek harbours is here very striking, and the lake, when connected with the sea by a proper channel, as it must have been until quite a recent date, must have formed a most spacious and commodious harbour.

Here we had the one thing wanting to identify the site, namely, the harbour of which Yakut tells us, where the ships which came to Dhofar in the frankincense trade found anchorage. The Abyssapolis of Ptolemy, like Manteion Artemidos (Μαντεῖον Ἀρτέμιδος), is evidently the Greek equivalent for some Sabæan name, or merely called from the existence near here of a remarkable abyss which we shall presently visit. The name given us by Ibm Khaldun of Mirbat is still attached to the village and anchorage 12 miles to the west, where the modern dhows go, and the term "Moscha" or "Mocha," which Arrian here introduces, is one frequently occurring on the Arabian coast, and apparently means, as Dr. Glaser tells us, an inlet or harbour, and consequently we have no difficulty in deciding that the ruins and harbour near Takha are those of the ancient town and harbour known to the Greeks as Abyssapolis (Ἀβυσσάπολις), or Moscha, and to the natives as Mirbat.

We skirted along the lake, which is called by the natives Kho Rowri, for a mile or more as we rode inland from the coast, until it dwindled into a narrow stream, and then lost itself in the dry rocky bed of a torrent coming down from the valley we were about to enter. A ride of 4 or 5 miles brought us up to the higher range of mountains again and the opening of the valley, and after following this for another mile, we pitched our camp at the foot of one of the most stupendous natural phenomena we have ever seen. The valley leading down to the sea has been filled up in the course of ages by a calcareous deposit, collected on either side of an isolated hill in the middle of the valley, about 1000 feet in height. This deposit has taken the form of a perfectly straight and precipitous wall 550 feet in height and three-quarters of a mile long on the eastern side of the hill, and about a quarter of a mile long and 300 feet high on the western side.

Over these walls feathery waterfalls precipitate themselves something in the style of the Staubbach, adding perpetually to the chalky secretions of which these walls are constructed. During the rains the falls must be magnificent, but, as I have said before, it was the height of the dry season when we visited it.

The general appearance of these walls is white and whitish-grey, with long white stalactites hanging down in tumbled confusion; it is streaked here and there, where the water perpetually falls, with patches of green, and below it plantains 20 feet high, enormous castor-oil plants, daturas, and many other plants flourish, and the Beduins have utilized the stream before it loses itself in the rocky channel to make small gardens.

The rocky channel below is itself very curious, being a flat surface about 50 yards across, of perfectly white calcareous rocks, and just below the wall where the water comes down there is an enormous amount of white calcareous deposit, quite soft and springy to walk upon.

The general aspect of these two walls is exceedingly striking from below, they are so sheer and straight; and it was curious to see the Beduins, who live above, like tiny dwarfs looking over the dizzy height in wonder at the first Europeans who had invaded their wonderful abode.

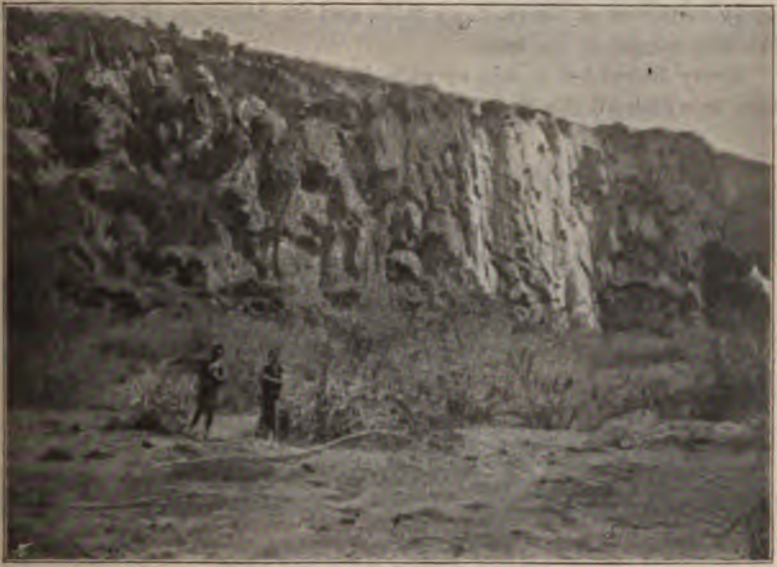
As we looked at this precipice, there seemed to be no doubt as to why Claudius Ptolemy had given the name of 'Αβυσσάπολις to the town on the coast. The merchants who came there for frankincense must have known of it quite well, and marvelled like we did at this great natural phenomenon in the mountains just behind the town. Similarly, another town in Arabia is called Abisamapolis ('Αβίσαμαπόλις) by Ptolemy, which has a steep mountain behind it 4000 feet high, up which a road leads to Marib (Sprenger, § 96), and it is also clear that Greek names were given by foreign traders to the places they visited from local peculiarities; for example, the *μαντείον Αρτεμιδος* must have been the seat of the oracle of some female Sabæan goddess corresponding in attributes to Artemis. Be this as it may, the stupendous abyss stands there still as one of the world's wonders, constructed by nature on the same principle as the pink and white terraces in New Zealand, and the calcareous deposits of Yellowstone Park.

To thoroughly explore the vicinity of this wonderful spot, we stayed in our camp at the foot of the abyss for three nights.

On the first morning we set out early to climb the hill and see what is to be seen at the top of the abyss. A rough camel-track has been made to climb this hill, which has been partly swallowed up by the calcareous deposit, and forms a spur covered with thick vegetation, with strange peeps through the branches at the wall and the waterfalls on either side: from this path we got an excellent view and photo of the smaller abyss, which the natives call Merga, whereas the larger abyss and the water at the top of it is known as Dirbat, which looks as if it had some close connection with the name Mirbat which we have just alluded to. More water falls over the smaller abyss than over the larger one, and when we were there two considerable falls were precipitating themselves over it.

On reaching the top of the abysses, we found ourselves on a lovely grassy plain, as flat as a billiard-table, and grazed over by quantities of cows belonging to the Gara herdsmen. We walked along for about a mile under the grateful shade of large trees, and when we had rounded the jutting hill, we found ourselves by the side of a long, narrow lake, which feeds the several channels which fall over the abysses; and when the Beduins want to water this extensive meadow, they dam up these channels, and thus have a natural source for irrigation provided for them even in the driest weather.

The banks of this lake are adorned with very fine timber, principally fig-trees and mimosa, amongst the branches of which a fine convolvulus with large pink flowers was creeping. The lake is full of bulrushes, and quantities of birds live on it—wild duck, herons, and waterhens; in some parts it is very deep, and it is divided into two parts connected by a narrow running stream; it is not broader in the dry season than a wide river, and in length it is about 2 miles, and the source which feeds it comes out of the mountains behind, and can be traced up a narrow gorge for about two days' journey.



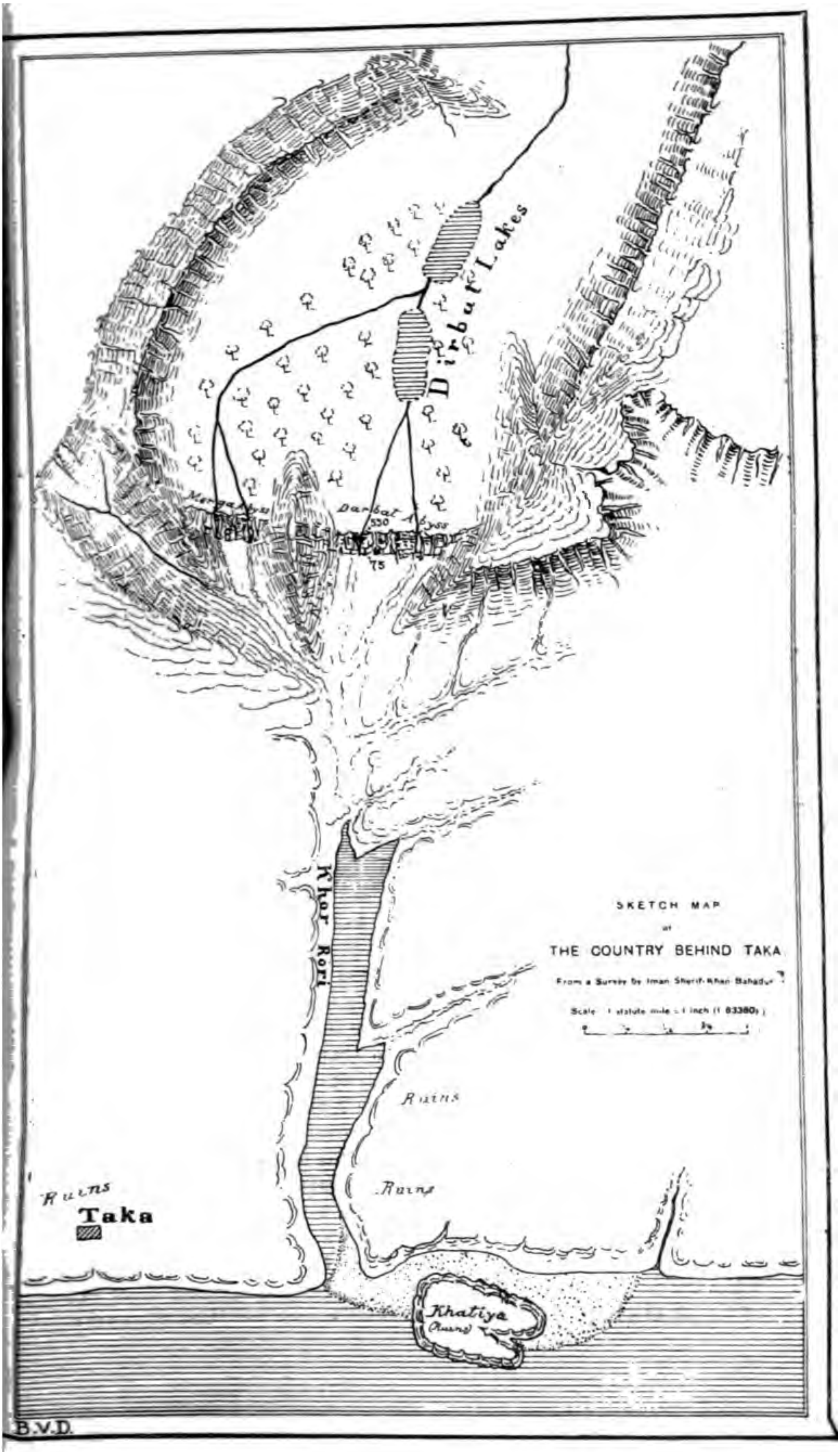
ABYSS OF DIRBAT, DHOFAR.

The Beduins have many superstitions connected with it, and, indeed, it is a most fairylike-looking spot; they affirm that jinnies live in the water, and that whoever wets his feet here is sure to have fever. Sheikh Sayel assured us he had actually seen the jinni, as also one which dwells in a cave hard by, where some Beduin herds have their farmstead. The mountains on either side are very curious, being honeycombed with caves and fissures, and in one place there is a large hole in one of the mountains through which daylight can easily be seen. The slopes of the hills on either side of the valley are covered with rich timber and vegetation, and the possibilities of this valley, if brought under proper cultivation, struck us as very great. Altogether, the abysses, with the lake and flat valley above it, struck us as quite the most weird and fascinating spot we had ever visited in any of our wanderings.

After going up to the head of the lake, we partook of some refreshments under a wide-spreading fig-tree by the side of the lake. We then went down to the end of the valley to peep over the abyss. The Beduins had been damming up the channels for irrigation, and we had to cross much swampy ground, and got our feet wet without catching the inevitable fever; and after pursuing our way for about a mile, we reached the edge of the large abyss and peeped over into the dizzy depth below. Needless to say the view is a most striking one, and the sun's rays made lovely rainbows in the feathery falls, and far below us our tents looked like tiny specks in the trees.

Every November a fair or gala is held up here by the side of the lake, to which all the Beduins of the Gara tribe come and make merry, and the fair of Dirbat is considered by them the great festival of the year. A round rock was shown us on which the chief magician sits to exorcise the jinni of the lake, and around him the people dance. There is doubtless some religious purport connected with all this, but, as I have said before, it is extremely difficult to get anything out of the Beduins about their religious opinions; like the Beduins of the Hadramut, they do not observe the prayers and ablutions inculcated by the Mohammedan creed, and the Arabs speak of them as heathen, but beyond this we could not find out much. Their language, too, is different from anything we had heard before. They can understand and converse in Arabic after a fashion, but when speaking amongst themselves none of our party, Arab or European, could make out anything they said, and from such simple words as we were able to learn—such, for example, as *ouft* for *wadi*, a valley, *shur* instead of *yom* for "day," and *kho* instead of *nahr* for a river—we were led to believe that they speak an entirely different language, and not a dialect as in the Hadramut.

LAKE OF DIRBAT, ABOVE THE ABYSS.



SKETCH MAP

OF

THE COUNTRY BEHIND TAKA

From a Survey by Iman Sherif-Khan Bahadur

Scale 1 statute mile = 1 inch (1 63360)

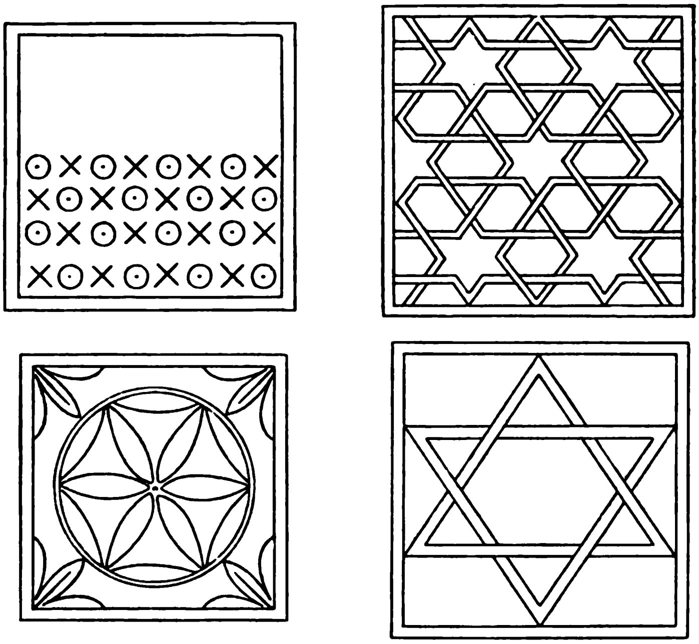
Sprenger (§ 449) supposes that the tribal name Gara or Kara corresponds to the ancient Ascites whom Ptolemy places on this coast; but as the Ascites were essentially a seafaring race, and the Gara are a pastoral tribe of hill Beduin, the connection between them does not seem very obvious. It is more probable that they may correspond to the Carrei mentioned in the campaign of Aelius Gallus as a race of Southern Arabia, possessing, according to Pliny, the most fertile country.

After another day spent in sketching, photography, and measurements, we felt that we had thoroughly explored the neighbourhood of the abyss, so we started back to Al Hafa, which we reached in three days, to prepare for our departure from Dhofar, and the interests which centred in this small district—the ancient sites, the abyss, and, above all, the surprising fertility of the valleys and mountains, the delicious health-giving air, and the immunity from actual danger which we had enjoyed—combined in making us feel that our sojourn in Dhofar had been one of the most enjoyable and productive of any expedition we had hitherto undertaken, and that we had discovered a real Paradise in the wilderness, which will be a rich prize for the civilized nation which is enterprising enough to appropriate it.

It was with regret and manifold misgivings that we now entered upon another phase of our Arabian journey, and faced a series of disappointments, which, had we foreseen, I think we should have tarried far longer under the favourable influence of Wali Suleiman.

He did all he could to assist us in the further progress of our journey. When we told him that our object was to go across the Mahra country by land to the Hadramut, he wrote and sent a messenger to the neighbouring Mahri Sultan of Jedid to ask his permission for an escort through his country; the reply was unfavourable, so we had nothing left to do but to hire a *bateel* and set sail along the coast for Kishìn, to the Sultan of which place I had a letter from the British political agent at Muskat. A long sea-journey in an Arab bateel is exceedingly uncomfortable. We had a cabin in the stern open all round, and with a sail in front to secure some privacy, and so low that we could not sit up in it, and for six days Mrs. Bent remained in her camp-bed without getting up, for the simple reason that there was nowhere else to go to. Then the smell of bilge-water was horrible. Every silver thing we had about us turned black, and our clothes will probably never recover from the sulphureous vapours to which they were exposed; the water in our butts was the home of cockroaches and scorpions, and our cooking was done in a square wooden box with ashes in it. For the first two days we had little wind, and made very slow progress, our compensation being that we passed slowly by most exquisitely beautiful coast scenery. From Cape Risut for about 100 miles the coast is exceedingly rugged and precipitous, rising sheer out of the sea to a height of 1000 feet. Vegetation here and there adorns the only available spots where earth is to be found, and now and again appeared outcrops of the calcareous deposit, like waterfalls down the cliff—small replicas of the abyss which we had visited behind Takha.

We anchored for one night off Rakhiut, the most western fortress of Wali Suleiman, which he has erected to ward off the attacks of the hostile Mahri tribes; another night we were in slight alarm from some Mahri Beduins, who called to us from the shore. Our sailors told us they were trying to beguile us ashore with a view to plunder; consequently we turned a deaf ear to their cries, and anchored about 100 yards from the shore. As slave-traders and wreckers the Mahris have the worst possible reputation along this coast amongst the owners of Arab buggalows, dhows, and bateels, and no wise captain ever ventures to land about here if he can help it. At length the longed-for breeze arose, and carried us in two days past Ras Fartak to the harbour of Kishin.



PATTERNS ON FOUR SIDES OF THE CAPITAL OF A COLUMN, DHOFAR.

Between Jedid and Ras Fartak the land is low and recedes, and as we sailed along we decided that it was the mouth of some big valley from the interior, and after careful cross-examination of the Sultan of Kishin and our sailors, we gathered that this was actually the mouth of the great Hadramut valley, which does not take an extraordinary bend as is given in our maps, but runs in almost a parallel straight line to the sea from west to east, and the bend represents an entirely distinct valley, the Wadi Mosila, which comes out at Saihut.

At Kishìn I landed to interview the Mahri Sultan Salem, and see if he would conduct us up to the Hadramut valley; here again we met with a positive refusal. "No one goes up that way," he said; "it is full of robbers." The town or village of Kishìn is a truly wretched place, with a few houses and reed huts scattered about in a dreary waste of sand; very different from the fertile plain of Dhofar, and very like the environs of Sheher, the sea-coast city of the Hadramut. Sultan Salem is very old and decrepid, and he is one of the chief sheikhs of the Mahri tribes, the head of a gang of thieves. Of course, he was civil enough to me with my letter from Muskat, but I think his people were rather sorry to see so likely a prize depart unmolested. Sultan Salem is nominally the lord-paramount of the island of Socotra, but he does not trouble his island dependency much, and from what I could see I should say he and his tribe were fast succumbing to senile decay; he is the brother of the Sultan of Saihut, another robber-chief of the Mahri tribe, who is greatly averse to admitting Europeans into his dominions. The fact is, these tribes feel that if their present state once became the object of European inquiry, they would be no longer able to exist in their present condition.

After our futile attempts to penetrate into the Mahri country, there was nothing left for us but to start again in our boat for Sheher, and rely on the promises which Sultan Houssein Al Kaiti had given us last year of sending us under safe escort to the eastern portion of the Hadramut valley, which must contain much of interest, and has never yet been visited by Europeans. He undoubtedly would have done it for us last year, having made all the necessary arrangements, but the season was so advanced that it was impossible to undertake it, as we must have waited till Ramazan was over. This year, however, to our great disappointment, our reception at Sheher was cold and inhospitable; the Sultan refused to let us go out of his town, and quite negatived all his previous promises. So far as this year was concerned the further survey of the Hadramut had to be abandoned. Our plan was to go up the Wadi Mosila, which is said to contain many interesting sites of ancient towns, to cross over the tableland again east of the hostile Katiri tribe, visit the tomb of the Prophet Hud, the Mecca of this portion of Arabia, and the volcano of Bir Barhut, which has been described to us as a large hole in the mountain-side, out of which issue volumes of smoke; it is similarly described by the old Arab geographers such as Hamdani, Idrisi, and others, and is the place described in the Koran as the abode of infidel souls after death. This neighbourhood should be replete with natural and historical interest, and we fondly hope that, with adequate support from the Aden Government, we may be able to reach it another year.

In conclusion, I must add that Imam Sharif Khan Bahadur, who accompanied us last year in the Hadramut, was again kindly placed at our disposal by the Indian Government, and was as before exceedingly useful to us in our various difficulties. To him we owe the maps of the Hadramut and Dhofar districts, and I am sure his regrets were equal to our own at not being able to join these two important surveys of Southern Arabia, and thereby place before the world a consecutive map of this unknown region.

NOTE FROM KEW ON THE COLLECTION OF PLANTS.

"The botanical collection, although more numerous in species than that made in the Hadramut, comprising about 250 species as against 150 from the latter country, has less of a local character, and, as might have been expected, exhibits a larger proportion of species having an eastern extension. Apparently it contains no new generic type; but as the plants have not yet been thoroughly examined, some one of the obscure-looking things may prove to be such. Certain it is, however, that there is no very striking novelty of this rank, and the number of new species will not be very great. The most interesting feature in the collection is the presence of specimens of several plants of more than ordinary importance in relation to their products or distribution. Noteworthy among these are the wild cotton, *Gossypium Stocksii*, and excellent specimens of the frankincense, *Boswellia Carteri*. This species of cotton was previously only known from Sind; and the specimens of frankincense prove Carter to have been right about the species from this region, though the fragments Kew previously possessed were insufficient to place the fact beyond doubt. The present specimens are exactly like those collected by Playfair and Hildebrandt in Somaliland. *Balsamodendron Opobalsamum*, one of the myrrhs, is also in the collection. *Acridocarpus Orientalis*, a very conspicuous member of the Malpighiaceæ, was found at the foot of the Dhofar mountains. It is interesting, because it was originally collected by Aucher Eloy, but the locality was uncertain. He probably collected it in the Muskat district. *Gypsophila montana*, a wiry herb of the Caryophyllaceæ, is an illustration of that element of the flora common to Aden, Sokotra and Somaliland.

"W. B. H."

Before the reading of the paper, the Chairman, Admiral WHARTON (Vice-President), said: It requires no words from me to introduce to this Society Mr. Theodore Bent, who has so often delighted audiences here, and I hope he is going to do so again to-night. Mr. Bent has had many difficulties to contend with, and he has been disappointed in not being able to accomplish all he has wished, but I feel certain his paper will prove very interesting, and I will now call upon him to read it.

After the paper, Sir WILLIAM FLOWER said: I am asked to say a few words, but I am sorry to say that Mr. Bent has not given me the slightest opening to say anything about his paper. He has been to a most interesting country, and he has told us he has collected plants, and I congratulate Mr. Thiselton Dyer, of Kew, for having the opportunity of seeing something of the flora of the country. But he has not mentioned a single creature—except I think I heard him speak of a wild duck—in the animal kingdom, about which I can have anything to say. Of course it is impossible that a man can do everything, and such explorers as Mr. Bent must first go and open out these unknown countries, and naturalists will follow afterwards. I am sure that in a country so full of beautiful vegetation as this, there must be a variety of interesting animals. In Mr. Bent's previous journey he had a collector of zoological specimens, and he brought back many of great interest; but I am afraid that the experience of taking the zoological collector was not on the whole, so far as the geographical results of the expedition were concerned, very satisfactory, and so Mr. Bent informed me, to my regret, before he went on this journey, that he should not impede himself with such a person again. Well, I suppose he was right, because, as I say, no man can do everything at once, and, although I have had no opportunity of saying anything in reference to my particular subject, I think I can say, as no one else has got up to do so, that we all here feel great satisfaction and pleasure at the safe return of Mr. and Mrs. Bent from this interesting journey. We all feel that they have done a very great work of geographical exploration, because they have brought before us features of the country which are entirely new to very many of us. I had no idea that behind the arid rock-bound coast, as it always seemed, of Southern Arabia could be found these beautiful green and watery vales, the photographs of which remind us at times of some parts of our own land. I therefore feel that Mr. Bent has done excellent work. Moreover, he and Mrs. Bent have performed this work under circumstances of considerable danger. They have happily surmounted all these dangers. And we hope this is not—I will not say the beginning, because they have begun already a long time ago—but we hope that this is only a stage of progress reached in a work which may go on for many years yet, and I am sure that geographical science, and with it the progress of humanity and civilization, will be very much forwarded by their exertions.

The Chairman: Mr. Bent has not taken us over a very large extent of country this time, but he has taken us to a very interesting one—to the home of the old frankincense trade, of which history scarcely knows the beginning. He is very much to be congratulated, I think, although he had difficulties that prevented him going in other directions where he wished to, that he found this country open; because the last account we had of it was, that you could not venture more than half a mile beyond the beach, and the inhabitants were always internecinely engaged in killing one another, and two men of different villages had to get an intermediary to allow them to talk to one another. Mr. Bent has happily come after the beneficent rule of Wali Suleiman, who has made his strong hand felt there, and who has opened the country up. I think there is nothing more interesting than going through a country with a history and endeavouring to recognize the old sites, and I think Mr. Bent has unearthed the harbour that must have existed in ancient days when the frankincense was more sought after than now, and when the trade was very much greater. Whether it could be made of any service now is another question. Mr. Bent seems to think it might be, and it it is very possible it may be so. I am sorry that on the maps we have here, Al Balad, the ruins of which he has discovered, is not marked. It is to the westward of Al Hafa, and I think there is no doubt that that was the old centre of civilization in this region. I think, ladies and gentlemen, you will all join with me in heartily thanking Mr. Bent for the very interesting information that he has given us in his paper.

BATHYMETRICAL SURVEY OF THE ENGLISH LAKES.*

By HUGH ROBERT MILL, D.Sc., F.R.S.E.

VIII. WASTWATER.

The third and last lake of the western radiating system is the deepest of the whole district, and the wildest in its scenery. It lies appropriately at the base of the loftiest mountains in England, Scafell Pike and Scafell (see Map V.).

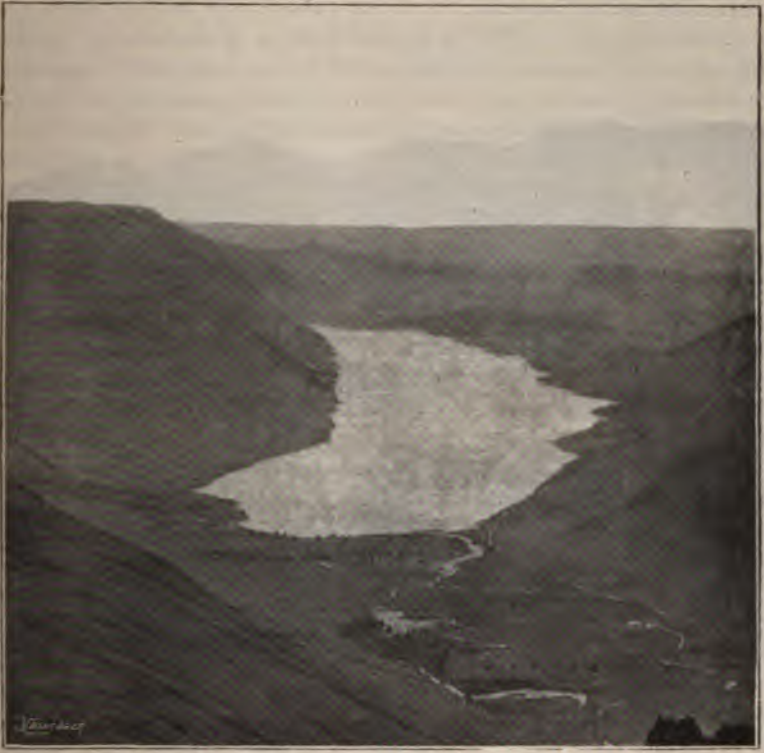


FIG. 10.—BIRD'S-EYE VIEW OF WASTWATER FROM STYEHEAD PASS, SHOWING SCREES ON THE LEFT, GENTLE SLOPE ON THE RIGHT.

(*Photograph by Mr. A. Pettitt, Keswick.*)

Wastwater has an area of 1·12 square miles, the same as Ennerdale Water, and as its total length is 3 miles, its average breadth is 0·37 mile, or 650 yards. The actual breadth varies from half a mile at the bay south of Nether Beck delta to quarter of a mile at the square-cut head, and the almost equally abrupt lower end. The drainage area tributary to the lake measures 18½ square miles, being rather more than seventeen times the extent of the water surface. The main tributary flows down the flat plain of lower Wasdale, and enters the head of the lake at the northern corner. The axis of the lake is slightly curved, but in the main runs south-west, following the outline of the left or south-eastern bank, which is in all parts steep, and along a great part of its length is flanked with the grandest screes in the Lake District (see Figs. 10, 11). For 1½ mile along the lower part of the lake the contour-line of 1500 feet of elevation runs within 1500 feet of the margin of the lake, and at some points the average slope of the whole hillside equals 45°. No definite stream flows down these screes. The right or north-western side of the lake does not present so uniform a coast-line as is furnished by the screes; the hillside is not so steep. It is separated from the lake by a band of gently sloping ground, and halfway along the lake the hills fall back and the shores become flat at the lower end. The Over Beck, Nether Beck, and Countess Beck flow in from valleys in the hills, and the delta of each makes a small but clearly outlined promontory on the lake. The right shore is also fretted with several tiny headlands formed by little ledges

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* Paper read at the Meeting of the Royal Geographical Society, on June 18, 1894. Revised in May, 1895. Maps, p. 135. Concluded from the July number.

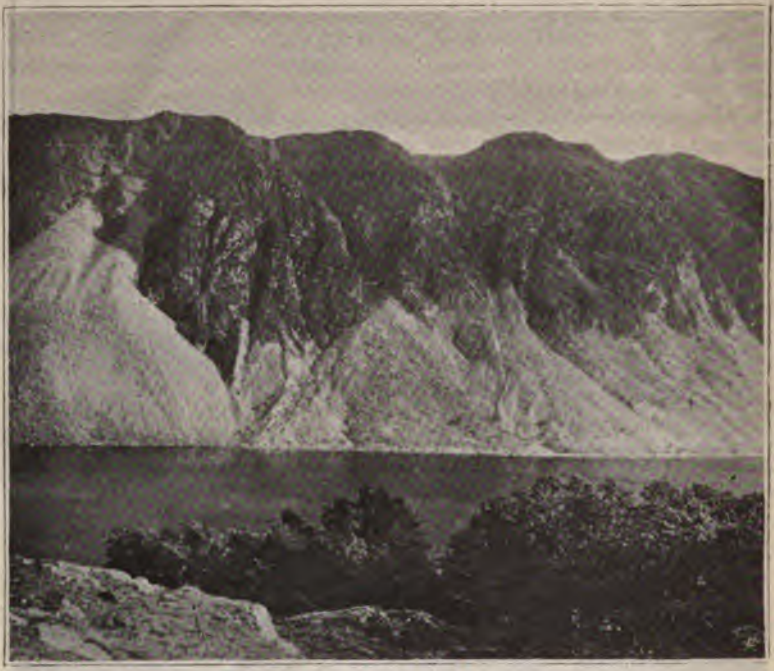

FIG. 11.—THE SCREES OF WASTWATER, FROM THE OPPOSITE SIDE OF THE LAKE.
(*Photograph by Mr. A. Pettitt, Keswick.*)

of rock sheltering small bays. There is one small rocky island close to the right shore, near the lower end of the lake.

According to the Ordnance Survey in December, 1864, the surface of Wastwater, when the water was high, was 204·4 feet, and when the water was low 199 feet, above sea-level. When we visited the lake on July 10 and 11, 1893, we found the bench-mark of 204·4 feet just 4·7 feet above the surface of the water, which may thus be taken as practically 200 feet above sea-level at the time of our soundings, so that the contour-line of sea-level would be the isobath of 200 feet (see Map V.).

During the two days of our work the weather was very bad, and the only available boat was ill-adapted for the purpose, but we succeeded in making 24 sections of a total length of 10½ miles, comprising 275 soundings. The closeness of the soundings averaged 26 to the mile, and 246 to the square mile. In fact, only Derwentwater, Haweswater, Bassenthwaite, and Coniston were more thoroughly sounded. The volume deduced from the soundings was 4,128,000,000 cubic feet, about equal to that of Coniston, and exceeded only by Windermere and Ullswater. The average depth was calculated at 134½ feet, and the lake next to it in depth is Crummock Water, with an average of 87½ feet. The average depth was 52 per cent. of the maximum, a smaller ratio than for Buttermere and Crummock, but larger than for any of the other lakes.

The configuration of Wastwater is severely simple. Along the axis it deepens with increasing slowness to 250 feet one mile from the head, remains nearly flat for a mile further, sinking only to 258 feet at the deepest place, and in the third mile the ramp rises less regularly to the surface at the outflow. Laterally, the isobaths cling closely to the coast-line, the inflections of which are followed, though with diminishing distinctness, to the greatest depths. In the middle third of the lake the average gradient of the slope below water on the right side was about 1 in 2·3 from the surface down to 200 feet, while on land an equally steep slope was not found until one ascended the hills for 300 feet above the lake, and a considerable distance from it; so that here there was no continuation of the sub-aërial slope of the valley-side, but a resumption of steepness after interruption by a broad strip of land of gentler gradient. On the left side, under the screes, the slope on the average of a mile was 1 in 1·5, and at one point at least the average angle from the shore to a depth of 200 feet was 1 in 1, or 45°. This was steeper than the scree, but as a rule the slope was exactly the same, so that if the lake were dried the screes would be seen rising from a level plain 200 feet below the present surface of the water, with a magnificent sweep upward of 1700 feet.

It is remarkable that the area of greatest depth lies fairly in the centre of the lake, not showing any tendency to lie nearer one side than the other. Almost one-half of the area of the lake is deeper than 150 feet. The area beneath 200 feet, that is, below sea-level, is 217 acres, and of this nearly 100 acres are within the isobath of 250 feet. This plain, one mile long and almost a quarter of a mile wide, undulates into one gentle dip of 8 feet to the deepest soundings of 258 feet, which occurred in several places. Wastwater deprived of water would present a singularly impressive appearance, with its steep wall of screes frowning above its long level central plain.

Representative sections across Wastwater are given on the margin of Map V. in No. 1 across the centre, showing the wide central plain and the steeper slope on the east than the west side. Section 2 shows how, at the lower end, the slope on the west side becomes much more gradual, while that on the east continues steep, giving to the ramp the appearance of a long gentle slope meeting an abrupt short one. Section 3, taken close to the upper end, shows how the flat-bottomed character is preserved to the very extremities.

The coast of the lake varied in its character. Along the right shore it was usually rocky, except where covered by the pebbles of stream deltas. The little rocky bays between rocky headlands were in all cases under 12 feet deep, the isobaths running unaffected outside them, but in the case of deltas the contours were distinctly flexed to a great depth. At the south end of the lake the river Irton escapes, forming first a wide, shallow basin under 10 feet in depth, and, unlike the rest of the lake, containing water-plants. It was separated from the lake by a sharp headland of sand and shingle, which, with boulders lying on its lakeward face, formed the southern end of the lake. On the left shore along the screes the large broken stones went down to a great depth, being distinctly felt by the sounding-line at 120 feet.

The deposits brought up by the tube-lead were interesting. Outside the line of stones off each shore there seemed to be a belt of orange-yellow clay, very tenacious and plastic, sometimes pure, at others mixed with minute pebbles. The clay varied in colour, growing redder toward the south. The whole of the flat floor of the lake was covered by a very soft incoherent mud of fine grain, and when wet possessed of a peculiar grey-greenish-brown colour; but at the southern end of the lake, on the ascending ramp, a few soundings brought up a peculiar mud of deep chocolate colour, unlike any other that was found.

A few temperature observations were made on July 11, showing 63° on the surface in the centre, and 66° at the southern end of the lake, the wind blowing strongly from the north. The central temperature sounding showed the warmth to be 61·0° at 60 feet, 44·8° at 90 feet, 43·4° at 120 feet, and 42·1° on the bottom at 230 feet, the depth not being great enough to allow the temperature of maximum density to prevail unchanged.

IX. CONISTON WATER.

Coniston Water, running parallel to the lower reach of Windermere, and very similar to it in outline, has an area of 1·89 square mile, being thus slightly smaller superficially than Derwentwater or Bassenthwaite. Since its extreme length is almost 5¼ miles (5·41), the average breadth of the lake is only 0·35 mile, or 600 yards. The widest part of the lake is slightly less than half a mile (870 yards), in the bay south of Church Beck. The upper half-mile and the lower mile and a half of the lake taper from the average breadth to mere points, while the whole central portion remains of almost uniform width, except for the minor accidents of rocky or deltaic promontories and their accompanying bays. In this particular its form differs from the square-ended lakes of the western and eastern mountain groups. The lake is fed by a drainage area of 23 square miles, equal only to 12½ times the water surface. This is proportionally the smallest drainage area in the district—Derwentwater, which comes next to it, receiving contributions from 15½ times its water area.

The lake, as a whole, lies north-north-east and south-south-west, the lower mile turning more nearly into a north and south direction (see Map VI.). The slopes of the hills along the eastern side are more continuous and rather steeper than those on the west. The slope is everywhere more gentle than that round the other mountain lakes considered in this paper, and at the head, on the right side, where the village of Coniston is situated, there is an extensive low plain. The stream which enters the head of the lake is short and insignificant. The most important tributaries, the Yewdale Beck coming from the north, and Church Beck from the north-west, enter three-quarters of a mile from the head on the right side, where they have built a large conjoined delta, which is extending rapidly. We were told that a boulder on this delta, now 20 yards inland from the lake, was always surrounded by water twenty or thirty years ago. Several small streams flow in along the right shore, farther south, each forming a little deltaic promontory; but Torver Beck, 1¼ mile from the southern end, is the only one of importance. The becks on the left side are more numerous, but smaller and shorter. From Peel Island to the outlet of the lake the left shore changes its character, becoming abrupt and rocky, with firmly outlined cliffy headlands and beautiful rock-encircled bays. Peel Island itself is a mass of rock clearly glaciated, and rising from deep water. It closely resembles the islands in Ullswater, although lying near the shore of the lake. Fir Island, on the other hand, lying close to the left bank halfway down the lake—indeed, touching the shore when the water is low—is a marked contrast, being low and flat, a mere pile of stones, like the islands of Derwentwater. The lowest half-mile of Coniston is almost cut off from the rest of the lake by a series of long tongues of low sandy ground running out from the left shore, and the plain at the outlet is extremely low and flat.

The altitude of the water surface was fixed by the Ordnance Surveyors on June 26, 1888, as 142·9 feet above sea-level. We were fortunate in finding a bench-mark of 144·0 feet cut on the stone wall of Kirby Quay, and as this was 1·5 foot above the surface of the water, the altitude during our survey was exactly 142·5 feet above sea-level. The lake was said to be about 2 feet below its average level, and the total range which had been observed (though not, I believe, recorded) at the Gondola pier at Waterhead was 6 feet. We were told that a change of level as great as 2 feet might occur in a single day after heavy rain; but, without questioning the truth of the statement, I am inclined to think that a strong wind blowing steadily up the lake might have more to do with this effect than the inflowing of rain-water, the surplus of which, reaching the lake, would require to be 2 inches over the whole drainage area, or a probable total fall of from 4 to 5 inches, if it were to raise the level all over by 2 feet. The captain of the steam-gondola, a very observant man, said that when the wind blew steadily up the lake he had measured waves 65 feet long from crest to crest, and 5 feet high from trough to crest. We ourselves noticed that a breeze raised much higher waves on Coniston than on any of the shorter lakes, on account, no doubt, of the greater "fetch."

Our work on Coniston occupied the 5th, 6th, 7th, and part of the 8th of July, 1893, in which time 53 sections were run, of an aggregate length of 18 miles, and including 576 soundings, which were spaced at 32 to the lineal mile of section, or 305 to the square mile of area. The cubical contents of the lake, at the level at which we found it, were estimated at 4,000,000,000 cubic feet, and the average depth came out as 79 feet, the same as for Windermere.

Above the delta of the Yewdale Beck the upper half-mile of the lake was found to be a flat shallow, enclosing only a very small depression, a little deeper than 25 feet, at the upper end. This shows that the lake-head is silting up much more rapidly from the Yewdale Beck on the south than from the little stream on the north—a state of matters found in no other lake so distinctly, although both Ullswater and Haweswater indicated similar action at greater depths.

The lowest half-mile of the lake at the outlet is shallower and flatter than the upper, but, descending abruptly from these flats, a single deep trough occupies the greater part of the lake, measuring 4¼ miles between the ends of the 50-feet isobath. This is, with the exception of the lower trough of Windermere, than which it is deeper, the longest straight depression of equal depth in the Lake District. The steepness of the gradient of the sides of the trough varies considerably from point to point, the isobath of 50 feet being much less indented than the coast-line. The average slope from the coast down to the floor of the lake at 100 feet depth is about 1 in 5 along the eastern side, and 1 in 4 along the western side—an arrangement which is somewhat remarkable, because the valley sides above water are both steeper and more continuous on the east than on the west. The disparity disappears on considering the interval between the 25 and 125 feet isobaths, which show nearly uniform gradients rather steeper than 1 in 4 on both sides. The section across the central plain shows the familiar steep sides and flat floor (Sect. 2, Map VI.), but both to the north and south of the greatest depth, which lies exactly in the centre of the lake, there is an approach to a condition of more gentle lateral slopes and a narrower plain. This appears in Section 3 on the south, which also shows the bank at the east side on which the rocky Peel Island stands, and in Section 1 on the north, which indicates a curious platform projecting from the lateral slope south of Lord's Point on the east side, at a depth of between 60 and 70 feet. The 50-feet curve does not show any indication of this shelf, while the 75, 100, and 125 isobaths swerve sharply from their normal trend. When these shallow soundings were first found, I took them as an indication of a bar dividing the trough into two basins, and accordingly ran an extra section across, which showed that the deep water near the eastern side is quite continuous. North of Lord's Point there is a smaller but similar shelf. The steepest slopes found in the lake are 1 in 2 at the west end of Section 2 (from 25 to 125 feet), and 1 in 2 off the delta of Beck Leven on the west side (from 0 to 100 feet). Judging from the configuration, the true head of the lake, turning a little to the left, ends squarely against the steep front of the Yewdale delta. The deepest part of the plain in the centre includes 110 acres at a depth over 150 feet, but this plain is neither so extensive nor so flat as those of Wastwater and Crummock. The deepest point found in it was 184 feet. The 150-feet contour indicates two depressions over that depth—one the central plain referred to above, the other an area lying about half a mile farther north, the deepest water in which was 151 feet deep. If the water were reduced to sea-level, there would remain two small lakes, the southern measuring 1½ mile in length and a quarter of a mile in breadth, and having a maximum depth of 42 feet; the northern one separated by a quarter of a mile, being only 9 feet deep, three-quarters of a mile long, and perhaps 200 yards wide at the most. Quite possibly the two might be connected by a channel, and give a long shallow lake of 2½ miles.

The accidents of the bench or shore flat were somewhat varied. In the very shallow stretch along the shore south of Church Beck delta, there was a very thick growth of sedges and rushes in water of about 2 feet deep, through which it was impossible to push the boat up to the coast-line marked on the maps.

The contrast between Fir Island and Peel Island has been already noted. From Peel Island long ledges of rock run north and south, just showing at the surface at their highest points, while deep water lies immediately to the west. These rocky shelves run mainly from north to south through the channel separating Peel Island from the shore, and although the greatest depth in that channel was 12 feet, it required a good look-out and careful steering to get the boat, drawing 18 inches of water, through the reefs. The line of 25-feet soundings runs outside the whole group, and clears everything.

A small bank of stiff clay, with only 3 feet of water on it, lies about 50 yards off the east shore, between Brantwood and Coniston Bank, there being 12 feet of water between it and the shore.

The sediments from this lake on the whole resemble those in Wastwater. Stones, pebbles, and gravel line the shores; beyond these in many places there are beds of stiff clay, and in the centre fine soft greenish-brown mud is everywhere found.

Temperature observations off Kirby Quay on July 5 showed the surface water to be at 63·4°, and the bottom, in 30 feet, at 60·9°. When looked at in connection with the temperature soundings made next day on the Central Plain, these figures show that the water at the upper end of the lake had been pretty thoroughly mixed, probably by the wind. Over the deepest water of the lake there was a layer 12 feet deep of uniform temperature, 67·2°; at 18 feet it was 65·5°, at 30 feet 58°·7, thence it cooled rapidly to 46·0° at 60 feet, and 44·3° at 120 feet. The bottom temperature could not be ascertained on this occasion, as the only line available for the thermometer was too short.

X.—HAWESWATER.

Although the nearest lake to a main line of railway, Haweswater is perhaps the least-known sheet of water in the Lake District. Its area is 0·537 square mile, and as its extreme length along its slightly curved axis is 2·33 miles, the average breadth appears as 0·23 mile, or 405 yards. The drainage area measures about 11 square miles of exceptionally steep and rugged mountain sides. The valley in which Haweswater lies is formed by the junction of a number of tarn-fed mountain streams at the base of Harter Fell, and runs between the steep slopes of High Street on the west and Naddle Forest on the east (see Map VII.). The upper end of Mardale is flat, and is probably an old lake-bed; the Mardale Beck,

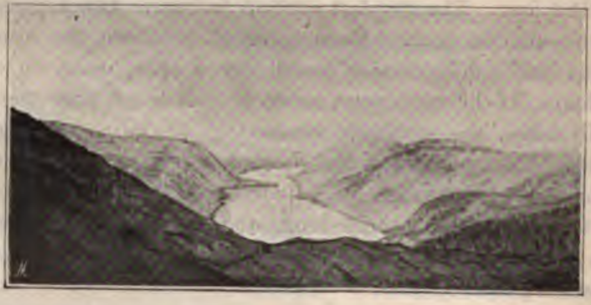

FIG. 12.—BIRD'S-EYE VIEW OF HAWESWATER FROM SPUR OF HIGH STREET.
(*From a Photograph by H. R. Mill.*)

which originally crossed it in winding loops, has been artificially straightened, and now flows into the lake at the south-eastern corner; traces of the old course flowing in near the south-western corner still remain. The head of the lake would be square but for the rounded delta of Whelter Beck, which occupies the south-western angle. For a mile and a half from its head the lake is known as High Water, and there it preserves an average breadth of about a quarter of a mile, with coast-lines closely following, in the main, the curves of the hillside contours. On the right side Guerness Gill comes in on a flat delta, causing a slight projection on the coast; but Guerness Neb and Boulderstone Neb are sharper promontories, flat also, and not associated with streams, but covered with large boulders. On the left or western shore of High Water the indentations are less marked, and there are no streams longer than half a mile, until High Water is terminated by the huge delta of Measand Beck, which abruptly narrows the lake from half a mile to little more than 100 yards. This delta measures one-third of a mile along its base, and is half that length along its front, the narrow channel which it leaves against the right bank being termed the Straits. The lower end of the lake, beyond the Straits, is three-quarters of a mile long and 300 yards wide, and bears the name of Low Water. No streams enter it. The Measand delta is the central and most prominent feature of Haweswater. The view of the lake from any of the spurs of High Street shows perfectly how accidental it is to the scenery of the region—a piece of modern architecture, geologically speaking, with no sort of relation to the primitive plan. Seen from above (Figs. 12 and 13), Haweswater appears to lie in a deep trough in a mountainous plateau, with steep slopes falling from the plateau brow to the water's edge, and here and there low "nebs" and smaller deltas appear touching the steep walls as the sheet of water does, and only to be distinguished from it by their colour. The great delta with its cultivated fields, which form the only arable land of the district, looks as if it were a huge earth-covered raft moored to the shore; by its flatness claiming affinity rather with the level water-surface than the steep sloping valley faces. Measand Beck enters High Water on the southern edge of the delta in two branches. It comes down by a picturesque "force" through a rocky gorge, which, when climbed, is found to open into a flat-bottomed valley 500 feet above Haweswater. Across this valley the beck meanders through the peat, and at its outlet it cuts through a bed of stratified sand, an unmistakable lacustrine deposit. The steep and rugged walls of this lateral valley rise abruptly from the peat-bog known as Fordingdale Bottom, and present exactly the picture which we have already described in imagination as a drained mountain lake. At the upper end some well-preserved glacial mounds and eskars are to be seen (Fig. 14). There is no evidence, so far as I know, to connect the emptying of this lake chronologically with the building of Measand delta, but it seems possible that either by ice-action or flood-action a vast torrent of stones and mud brought down the bulk of the deltaic material in a very short time, for in no other case in Lakeland do I know of so large a piece of finished work resting under the hand of a mountain torrent. Whatever its origin, we see here an advanced stage of the process which, when completed, has cut off Buttermere from Crummock, and Derwentwater from Bassenthwaite.

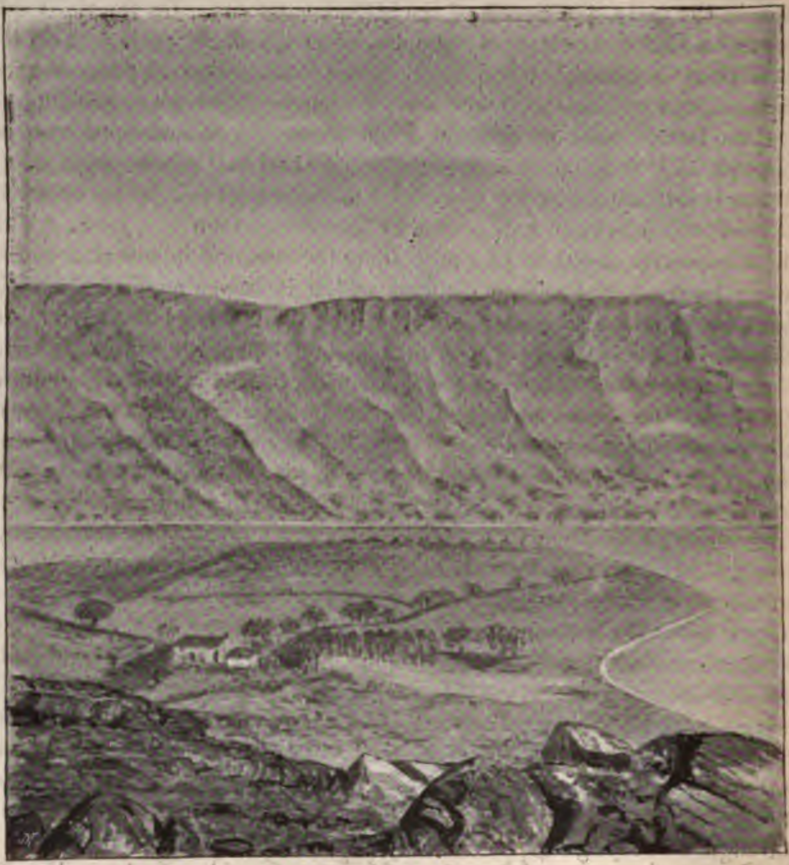

FIG. 13.—MEASAND DELTA FROM ABOVE.
(*From a photograph by H. R. Mill.*)

The northern or down-lake edge of the delta turns sharply in from the end of the Straits, while the southern edge runs round from the Straits in a gentle curve, forming the quadrant of a circle. The northern edge is composed of sand, covered with short grass, and slopes gently into the water. But in the middle of the Straits the sandy shore changes abruptly to a beach of shingle, falling steeply into the lake, and heaped up along the edge a little higher than the flat land behind. This shingle beach is devoid of grass, but thickly grown with small shrubby willows, with larger trees behind. It would seem that the down-lake current, intensified by the constriction at the Straits, and often accelerated by a south-west wind, carries the *débris* brought down by the beck along the front of the delta, dropping the pebbles and shingle along the southern edge, and only sweeping sand and mud round the curve.

The whole coast-line of Haweswater was diversified, like Ullswater, by boulders large and small, usually forming a single row just at the water's edge. At one or two points on the west shore, rocks cropped out. It was noticed here that the rocks, about 3 inches above water-level, were marked by a band of white colour, perhaps 4 inches wide on perpendicular parts, and spreading widely on gentle slopes. This white band appears bounding the entire lake in some of the photographs taken from a height, but it disappears when the stones are wet. It is probably a calcareous deposit from the water, but it might possibly be diatomaceous. It was not thick enough to scrape off; but as the phenomenon did not appear so distinctly in any other lake we visited, it might be worth while to make a thorough examination of it in this case.

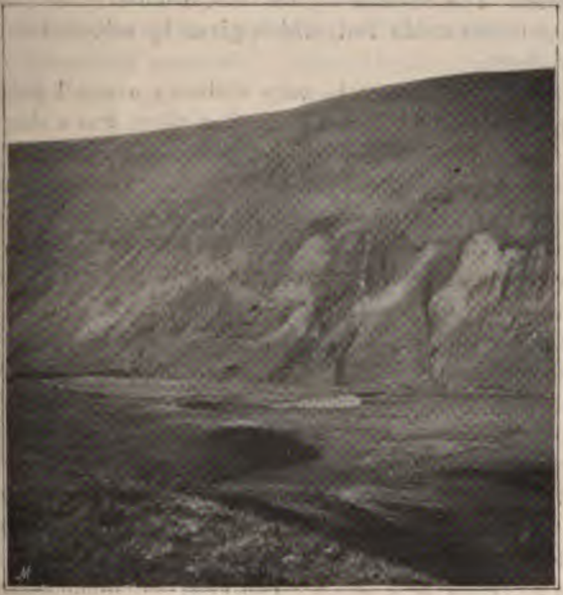

FIG. 14.—FORDINGDALE BOTTOM, SHOWING GLACIAL REMAINS.
(*Photograph by H. R. Mill.*)

The shallow floor of Low Water was covered with weeds, growing vigorously; but, except for some sedges at the upper end of High Water, there were no signs of aquatic vegetation in the larger body of water.

The altitude of the lake-surface is given by the Ordnance Survey as 694 feet. It is the highest lake we sounded, and only mountain tarns are found at greater altitudes. The boatman considered that the extreme fluctuations of the lake-level did not exceed 3 feet.

Mr. Heawood and I sounded the lake on March 24 and 26, 1894, and we are indebted to G. Little, Esq., of Penrith, agent for Lord Lonsdale, for the free use of the boat kept on the lake. Twenty-six sections were made, measuring in all 7½ miles, and including 228 soundings. The average closeness of the soundings was 30 to a mile, and their completeness is indicated by 403 being made per square mile, the lake having been surveyed more closely than any other except Derwentwater. The volume of the lake, deduced from the contoured map, is 589,600,000 cubic feet, which gives by calculation 39½ feet as the average depth.

Low Water was found to be very shallow; a small patch near the Straits alone exceeded 25 feet, and in that there was a single sounding of 52 feet. Although interrupted by the delta, this patch of deep water lies in the line of the main trough of High Water, and indicates that the deltaic material has filled up a section of that trough right across the lake. The maximum depth in the Straits was only 22 feet, and in most parts of this narrow channel the depth was under 10 feet. The section across the southern end of the Straits (Section 1, Haweswater, Map VII.) shows that the slope is much steeper off the face of the delta than on the opposite shore. The section (No. 2) across Low Water, just north of the delta, shows the way in which the accumulations have shallowed the water on the west side as compared with the east. The main depression in High Water exceeds 50 feet in depth for nearly a mile and a half. At its upper end the slope is steepest at the very head, and again off the Guerness Gill delta. In its lower half the west side is much steeper than the east, although the lower slopes of the hills are equally steep on both sides. The steepest sublacustrine slopes off the mouth of Guerness Gill on the right, and of Nook Syke on the left shore, were one in three, from the surface to 50 feet. Along the deepest part of the trough, rather nearer the north end than the middle of High Water, the average gradient of the left (western) lateral slope down to 75 feet was 1 in 4; that of the right lateral slope was scarcely steeper than 1 in 7. Near the head of the lake there was a depression below 75 feet, in which the deepest sounding was 78 feet, and this shoaled northward to 66 feet, deepening again opposite Nook Syke to a small patch over 100 feet, in which the maximum sounding of 103 feet was found.

The main trough of Haweswater is not so nearly flat-bottomed as that of the other mountain lakes. Section 3 across the deepest part shows that both sides slope, the western most steeply, towards the deepest line; while Section 4 across the upper and shallower depression shows the great steepness of the slope of Guerness Gill delta on the east, and approaches more nearly to the flat-bottomed character of Wastwater and Crummock. If we may assume, although it is an assumption which has no direct evidence to support it, that the flatness of the central plain of a deep lake is evidence of its having been long exposed to sedimentation, the more angular build of Haweswater would indicate that it is more recent in its origin than the western group of lakes, thus suggesting the origin of the Measand delta from some more rapid cause than normal sedimentation.

Temperature observations were made on March 26 in the deepest part of High Water, when the water was found at 41·0° from the surface to 12 feet, and at 40·3° from 30 to 75 feet, while it was 39·7°, or practically at the maximum-density point, on the bottom in 100 feet. In Low Water the surface was at 43·8°, and the bottom in 27 feet at 42·6°, thus showing the more powerful effect of solar heating in shallow water.

The samples of sediment obtained were chiefly a coarse-grained, almost sandy, grey mud, and no indication was found of clay on the bottom; but as the sounding-tube was not always attached to the lead, I would not speak positively as to the absence of clay.

XI. ULLSWATER.

The only two lakes of the eastern system of drainage are Haweswater and Ullswater, the latter second only to Windermere in size among the lakes of the district, and the most complicated of all the narrow lakes in its configuration. Its area is 3·436 (or roughly 3½) square miles, and its length, measured along the winding line which marks the centre of the lake, is 7·35 miles. Hence the average breadth of the lake is 0·47, or nearly half a mile (820 yards); while the extreme breadth at right angles to the axis of the lake is 0·62 mile, or 1100 yards. The total drainage area measures about 56 square miles, being thus fully sixteen times as large as the water surface (see Map VII.).

While most of the lakes of the district have a gently curved form, Ullswater presents two abrupt changes of direction, allowing the lake to be divided into three reaches. Starting from the southern or upper extremity of the lake, the first or Upper Reach runs for a little over 1 mile due north to the island of House Holme. The Middle Reach is 3 miles long, running east-north-east from House Holme, and gradually narrowing to the line, joining Skelly Neb and Geordie's Crag, where the lake is at its narrowest—only 430 yards from point to point. The lower or Northern Reach is also 3 miles in length, and runs nearly straight from Howtown Wyke, the west side of which appears to close it, in the direction north-east by north, maintaining a nearly uniform breadth all the way. The upper part of this reach is continued into the Howtown valley rather than into the Middle Reach of the lake.

Patterdale, which extends southward from the head of Ullswater, is traversed by the Goldrill Beck, which enters almost in the centre of the straight shore terminating the lake. Its water is derived from a number of tarn- and torrent-fed tributaries coming in from Grisedale (with Grisedale Tarn) and Deepdale on the west, and from Brothers Water and the Kirkstone Pass, with Hayeswater and the Angle Tarn on south and east. Half a mile farther down the lake, on the left or western side, Glenridding Beck flows in on a lateral delta which is growing very rapidly and has formed a marked constriction of the lake. On fixing the position of this delta by sextant bearings, we found that its edge was 200 feet farther out in the lake than in 1880, when the Ordnance Survey was made. It has its origin in the Red Tarn and other reservoirs, and is more energetic as a silting agent than it would naturally be, on account of the extensive lead-mines on its course, the crushed *débris* from which it carries down. Glencoin Beck comes in with a much smaller delta at the junction of the Upper and Middle Reaches, also on the left side; but on the right side there are no tributaries, except short torrents after rain. The Upper Reach is rugged and picturesque in its coast-line; the whole, except the alluvial flats on the south, and at the mouths of Glenridding and Glencoin, being bare rock descending abruptly into the lake. The hills all round rise steeply to heights exceeding 2000 feet, and on the right shore the slope is most continuous and steepest, on the flank of Place Fell. At the upper end of the reach, the slope of the land, on the average of 300 feet under Silvery Crags, descending from Silver Hill, is as steep as 1 in 1·3 while on the opposite side Stybarrow Crag is in parts even more abrupt

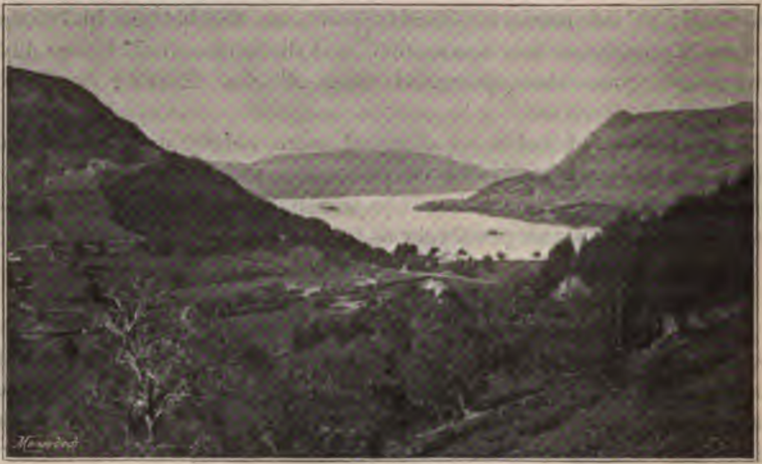

FIG. 15.—ULLSWATER FROM ABOVE GLENRIDDING, SHOWING ISLANDS AND GREAT BEND

(*Photograph by Mr. Herbert Bell, Ambleside.*)

The Middle Reach receives more streams than the upper, as its abrupt swerve to the eastward causes it to cross the mouths of a series of long north-running valleys, which carry the drainage parallel to the western edge of High Street. For a mile from Silvery Crag, the right shore is formed by a fine scree of large angular blocks of stone, tufted in summer with the parsley fern, having an average slope of 1 in $1\frac{1}{4}$ for the first 400 feet above the lake. The base of this slope cuts the water in an almost straight line, unbroken by bay or promontory, the blocks of stone having settled themselves almost as regularly as if placed by hand, in the form of a bulwark. Then, on the right shore, there is a mile in which the steep hill-slopes sweep back, forming two valleys, across the mouths of which the Scalehow and Sandwick Becks have laid down a broad alluvial meadow, running out their deltas into two prominent spits of lowland defining three bays of gentle curve. The last mile of this shore is steep and rocky again, on account of the circular mass of Hallin Fell, which a rise of the lake-level by 100 feet would convert into an island a mile in diameter. It forms a series of rocky

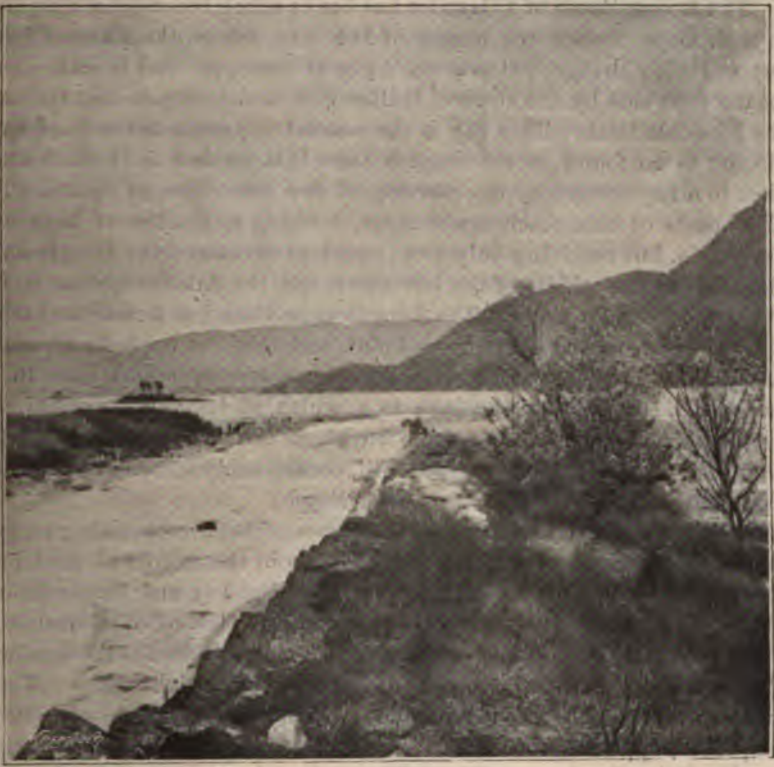

FIG. 16.—DELTA OF GLENRIDDING BECK, FROM THE LAND.
(*Photograph by Mr. W. Ellison.*)

points and bays, terminating the Middle Reach in Kailpot Crag and Geordie's Crag. The left or northern side of the Middle Reach is also steep, although less so than the opposite shore, and it is wooded as a rule. The only important accidents of the coast-line are Skelly Neb at the lower end, defining Gowbarrow Bay to the west of it, and Aira Point, a mile from the upper end of the reach, formed by the delta of Aira Beck, which drains Deepdale. This delta is larger than that of the Sandwick Beck on the right shore.

The Lower Reach of Ullswater has banks which become more gradual in their slope toward the mouth of the lake, where the Eamont flows out at Pooley Bridge. Howtown Wyke at the upper end is made steep on the west side by the slope of Hallin Fell, and it receives at its head the Fuesdale Beck. This bay is the nearest approach to the fjord type of inlet to be found in the English Lake District, but it is much more akin to a bay formed by the meeting of two coast-lines at right angles. The coasts of this reach are sinuous, forming a number of bays and headlands, but receiving only two important streams—the Longthwaite Beck, about the middle of the left shore, and the Aik Beck, close to the outlet on the right shore. The Longthwaite Beck has formed a sharply pointed delta, named Castlehows Point, and this lies opposite Thwaitehill Neb, a low projection with which no stream seems now to be associated, constricting the lake to a width of 470 yards, not quite so narrow as at Skelly Neb. At the outlet of the lake on the left side, Dunmallet, a conspicuous wooded hill, considerably steepens the gentle slope of the land bordering the Lower Reach.

The islands of Ullswater are all masses of solid rock, rising steeply from a great depth of water. Wall Holme in the middle of the Upper Reach (shown as a flat island with trees in Fig. 16), and House Holme at its lower extremity (a conical island to the left of Wall Holme in Fig. 16), rise almost in mid-channel; Ling Holme between the two, and Cherry Holme nearer the upper end, lie nearer the right shore. There are also two shoals marked for the safety of the steamers—one, Peely Slapehold, opposite Horrockwood, near the middle of the Lower Reach; the other in Gowbarrow Bay. The rocky islets all bear clear marks of ice-action, being smoothed and striated, with gently rounded curves toward the south, where the ice-markings remain more distinct under water than on the dry surface. The northern sides of the islands show rough angular fractures, indicating the advance of ice from the south.

On the fine gravel beach of Aira Point, a little ridge of gravel, about 2 inches high and 8 inches wide, was observed running parallel to the lake about a foot from the water's edge, evidently the result of wave-action on the previous day, when the weather had been squally. Water-plants were occasionally observed in the shallow water of some of the lateral bays, and at the ends of the lake, but they were never so luxuriant as those in Derwentwater.

The altitude of Ullswater was determined by the Ordnance Surveyors as 476·6 feet above sea-level. On the occasion of our visit, the water was said to be close to, but rather above its usual level. A distinct mark was observed on the cliffs near Glenridding House about 8 inches below the surface of the water, and another fainter mark was seen about 1 foot 6 inches or 2 feet above the actual surface. The fact that the submerged rock in Gowbarrow Bay had exactly 3 inches of water over its highest part will enable the exact level of the water to be determined at any future time.

We were occupied with the soundings of Ullswater from June 29 to July 3, 1893, and in that time we made 64 sections, measuring 25 miles in total length, and including 831 soundings. This was at the rate of 34 soundings per mile of section, or 242 per square mile of area. The volume of the water in Ullswater was calculated from the contoured map as 7,870,000,000 cubic feet, from which the average depth of 83 feet was deduced. This depth is only exceeded by Wastwater and Crummock. The deepest water found in the lake was 205 feet.

The configuration of Ullswater shows a certain relation to the three reaches in the deeper parts, but to the depth of 50 feet the lake may be looked upon as a single depression, extending from within 150 yards of the head to about half a mile from the mouth; the shallowing at the outlet is, however, quite abrupt from the surface to the depth of 25 feet, and then becomes gradual. The isobath of 50 feet follows the coast-line closely as a rule, coming nearest to it along cliffy promontories and the edges of growing deltas. It diverges considerably from the land at three points along each shore. On the right side the submerged shelf, from which Cherry Holme rises in the Upper Reach, carries the 50-feet contour halfway across the lake, and in the Lower Reach water less than 50 feet in depth fills the south-western half of Howtown Wyke, while from the northern side of Thwaitehill Neb a broad shallow runs nearly across the lake, and is met by another of less extent from the left side, almost separating the northern end of the trough from the main body. The second sharp deflection of the 50-feet line from the left shore surrounds the shoal off Horrockwood, and the third occurs where the line runs across the mouth of Gowbarrow Bay, where the second marked shoal is situated.

The isobath of 100 feet defines two distinct hollows, and in every part, except, of course, at the ends of the depressions, it follows the 50-feet line closely. The southern hollow extends from Wall Holme in the middle of the Upper Reach to opposite Hallin Fell, a distance of 3½ miles. It is separated by three-quarters of a mile of shallower water from a patch exceeding 100 feet in depth, which runs from Howtown Wyke to Peely Slapehold, a distance of one mile.

Considering the deeper water, we see that in the Upper Reach depths exceeding 125 feet extend across almost the whole breadth of the lake from Wall Holme to House Holme, and in the centre there is a patch more than a quarter of a mile in diameter which is bounded by the isobath of 150 feet; the deepest sounding found in it was 162 feet. The section across this depression from Ling Holme to the left side (Section 1) shows slopes of extraordinary steepness. A fall of 150 feet from the edge of Ling Holme takes place in a horizontal distance of 125 feet, the gradient being 1 in 0·83. This is very exceptional, and doubtless represents a terrace from which the island rises, with a precipitous slope in continuation of the steep slopes of Silvery Crag, which towers above. The slope of the left side of the depression is just half as steep, being 1 in 1·66. The bar which divides this depression from the great trough of the Middle Reach is about 300 yards wide between the 125-feet isobaths on north and south; and the pyramidal mass of rock, the summit of which emerges in House Holme, occupies its central part. On the right the channel defined by the 100-feet isobaths between this obstruction and the shore is 100 yards wide; on the left it is 200 yards, the whole breadth of the lake at the point being 770 yards. Considerable interest attaches to this residual mass of rock in the centre of a deep channel, with much deeper water to south and north of it than to east or west, and five lines of soundings converging on its summit enable us to speak with some confidence. The isobaths of 25, 50, 75, and 100 feet surrounding House Holme show that it is a triangular pyramid, the base being almost equilateral, and measuring 200 yards in the side of the 100-feet isobath. One side faces the Upper Reach, running at right angles to the axis of that channel; another side similarly faces the Middle Reach, running at right angles to its axis; while the third is approximately parallel with the left shore. One angle points across the narrow channel to the rocky spur of Silvery Crag on the right, and one is directed due north. Section 2 (of Ullswater, Map VII.) is drawn through the angle pointing to Silvery Crag, and at right angles to the side facing the left shore. The somewhat similar profile of the channel at Wall Holme is given in Section 3. In the longitudinal section (No. 5) the profile is drawn through the centre of Wall Holme and House Holme, and also in dotted lines through the deepest part of the channels on the right and the left of the islands. These will probably be found most interesting by glacial geologists.

The Middle Reach of Ullswater is one long trough approximately flat-bottomed, with sides parallel to the coast-line, and following all its larger windings. This is particularly marked in the case of Aira Point, which is continued in a steep spur to the floor of the basin, inflecting every isobath down to 175 feet. Depths over 150 feet occur along a distance of 2 miles, and depths over 200 feet in a distance of half a mile, covering an area of 36 acres. The depression is deepest at the southern end, where 205 feet was the maximum sounding obtained. Section shows the form of the lake-bed at the deepest part, bringing out the fact that the slope on the right side is much steeper than that on the left, and suggesting that flat-bottomed troughs are only obtained when the lateral slopes on both sides are equal. Here the deepest point lies only 300 yards from the right shore and 680 yards from the left, the lake at the place being nearly at its widest. The average sublacustrine slope on the right side down to 150 feet of depth is 1 in 1·5, while the gradient on the left side (excluding the steep slope off Aira Point) is only 1 in 4·7, corresponding closely to the gradients of the hillsides on the two shores of the lake. The similarity of the scree-coast of Ullswater along its deepest tract with that of Wastwater is remarkable. Following the line through the deepest water of the Middle Reach, we observe it deepen abruptly to its maximum half a mile from House Holme,

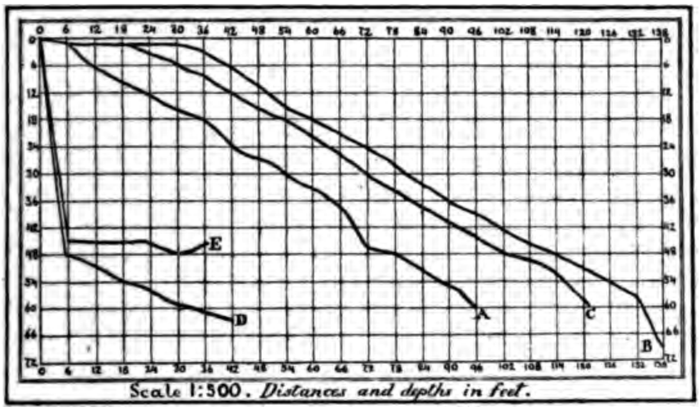

FIG. 17.—SECTIONS OF EXCEPTIONAL SLOPES IN ULLSWATER IN CORRECT PROPORTION.

and then shoal very gradually to its junction with the lower reach at Skelly Neb, 2½ miles away.

The Lower Reach is the shallowest of the three. In the mile-long hollow at its upper end, which exceeds 100 feet in depth, the maximum sounding was 125 feet at the southern extremity.

Several sets of detailed soundings were made in Ullswater off particularly interesting points, the soundings being taken at measured intervals of 6 feet. They show well the characteristic front of the deltaic cone, and also the gentle slopes of the stony shoals and the abrupt descent of precipitous cliffs.

The first group refers to the great delta at Glenridding Beck, the detritus for the construction of which may be looked on as artificially prepared at the mines up the valley. Section A (Fig. 17) is practically the end of Section 2 in minute detail, being taken at right angles to the shore, straight out toward the axis of the lake from the centre of the delta; Section B, at right angles to the shore, was directed south-eastward from the southern edge of the delta, whilst Section C was similarly taken from the north-eastern edge north-eastward. The three thus determine the slopes along the face of the delta.

Distance from shore...	0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126	132	138	ft.
Section A, depth	0	1	6	9	12	16	18	24	25	30	33	37	46	48	52	55	60	—	—	—	—	—	—	—	ft.
„ B, depth	0	0	0	1	1	1	3	6	10	15	18	22	24	28	33	36	39	43	45	48	52	54	57	69	ft.
„ C, depth	0	1	1	1	3	6	9	12	15	18	22	25	30	33	37	40	43	48	49	52	60	—	—	—	ft.

Taking the angle of these slopes from the point where the water began to exceed 1 foot in depth, the average appears to be 32° for A in the centre of the delta, and 30° for B and C on the up-lake and down-lake edges. The lower part of A, below 25 feet, had a slope of 35°, of B 30°, and of C 32°; the upper part of the three slopes had the angle 32°.

Two sections were made from the rocky point on the opposite side of the lake immediately opposite the delta, D being directed north-westward toward the Steamer pier, E south-westward toward Patterdale Hall.

Distance from shore	0	6	12	18	24	30	36	42	ft.
D, depth	0	48	51	54	55	59	61	63	ft.
E, depth	0	45	45	45	45	48	45	—	ft.

These slopes are almost exactly 83° in the first 6 feet, and are the best instance in the district of a rock plunging "perpendicularly" into the water, which after the first plunge remains of practically equal depth, the slope of E being imperceptible, and that of D only 21°. The curves on Fig. 17 are drawn in correct proportion, and show the true slopes of the delta face in A, B, and C, and of the steep cliffs in D and E. The water of the lake happened to be unusually clear on several of the days of our visit, and it was possible to see as well as to sound one interesting feature of the shore slope, which was well developed on the left shore of the Middle Reach. This is the bench or shelf formed by wave-action on a readily eroded coast. In its most characteristic form a pebbly flat of very gentle gradient extended into the lake from the coast-line for about 60 feet, the water deepening gradually from nothing to 3 feet. Then an abrupt slope commenced, and simultaneously the pebbles began to be coated with mud. When the boat was held with her bow pointing outward and her stern over the sharp line where the steep slope began, the depth at the stern was 3 feet, and at the bow, 24 feet distant, it was 12 feet. Thus the slope had abruptly changed from 1 in 20, or 2°, to something more than 1 in 3, or more than 18°.

The deposits obtained from the deep water of the lake were everywhere fine soft mud, and in no instances were specimens of plastic clays found of the kind common in Windermere, Coniston Water, and Wastwater.

Temperature observations were made on several occasions, but as the weather was variable, with intense heat and frequent falls of cold rain, it is impossible to compare surface temperatures, which varied from 55·7° on June 29, at the upper end, to 66·2° off Howtown pier on July 3. In the Upper Reach, off Ling Holme, the temperature fell gradually from 56·3° on the surface to 54·0° at 24 feet, and then steadily to 47·0° at 60 feet, and 43·7° on the bottom in 144 feet. On the same day, in the southern part of the Middle Reach, the surface temperature was 61·9°, that at 60 feet 46·0°, and at 132 feet it was 44·0°. In the lower basin the surface temperature on July 1 was 66·0°, and at 40 feet it was 55·1°, showing that the water was warmed to a greater depth than at the upper end.

XII. Windermere.

Windermere, the largest lake in England, has an area of 5·69 square miles, not including islands, and it measures 10½ miles in total length along the curved axis of the lake, while the direct distance from the head to the mouth, measured across the projecting land of the western shore, is 10 miles. The average breadth of the lake, obtained by dividing the area by the length, is 0·54 mile, or 950 yards, and, although this takes no account of the islands, the difference obtained by including these would be very slight. The widest part of the lake is in the bay north of Millerground Landing, where the breadth at right angles to the axis is 1610 yards, somewhat less than a mile; the same breadth is found in the sharp inlet of Rayrigg Wyke, a little farther south. It is often stated that the north end of Windermere is 1¼ mile wide, measuring from the end of Pull Wyke; but this measurement is not at right angles to the axis of the lake, and so does not correspond to its breadth.

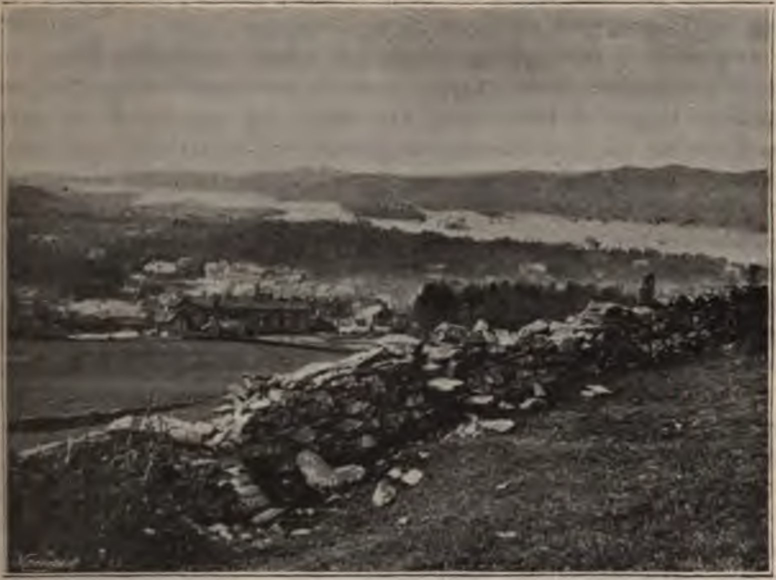

FIG. 18.—WINDERMERE FROM ABOVE WINDERMERE VILLAGE, SHOWING ISLANDS.
(*Photograph by Mr. A. Pettitt, Keswick.*)

Windermere receives the drainage of 88 square miles, or 15½ times its water area. Although nearly three times as large as Bassenthwaite, Windermere has a drainage area little more than half the size of that of the smaller lake.

Superficially, Windermere may be divided into three parts: the Upper, or Northern Division, which is the widest; the Middle Island Division, in which all the larger islands of the lake are found; the Lower, or Southern Division, which is the longest. These divisions are more than superficial; they correspond to distinct varieties of configuration. The lake, as a whole, is surrounded by a flatter shore than most of the others, and the indentations are more numerous and varied. Its surface is the nearest to sea-level; the surrounding heights also are lower, and the land slopes are steep in comparatively few places (see Map VIII.).

Our work on Windermere occupied five days—from the 4th to the 8th of September, 1893. Eighty sections were made altogether, the combined length of them being 41½ miles. On account of the great simplicity of the structure of the basins, 865 soundings were found sufficient to delineate the main features, though this was at the rate of only 21 soundings in a lineal mile, or 152 per square mile—the smallest number proportionally thought necessary for any of the lakes. The volume of water in Windermere, calculated from the isobaths, is 12,250,000,000 cubic feet—as much as Ullswater and Wastwater put together, and twelve times the volume of Derwentwater or Bassenthwaite. The mean depth comes out as 78½ feet, practically the same as that of Coniston, and less than that of Wastwater, Ullswater, and Crummock. The deepest water found was 219 feet; thus for maximum depth Windermere ranks next to Wastwater.

The northern division of the lake may be looked upon as terminating at a curved line drawn from Rayrigg Hall through Rough Holme and Lady Holme to Bass How. It is 4 miles long, and of nearly uniform breadth, averaging about 1300 yards. For 3 miles from the head the direction of the lake is south-south-east, but at the end of the Troutbeck delta, which narrows the lake to 800 yards, the direction changes to due south, and the breadth increases. The head of the lake receives the conjoint streams of the Rothay, carrying the overflow of Grasmere and Rydal from the north, and the Brathay from Elter Water and Langdale. The stream enters by an alluvial flat on the east side of the picturesque rocky promontories of Gale Nase Crag and Hanikin, which enclose deep bays. (These promontories appear in the left of the picture in Fig. 2.) At the north-western corner Pull Wyke forms a short fjord-like inlet, into the head of which flows the short Pull Beck. Immediately to the south, a wide flat meadow runs back for rather more than a mile, and in it Blelham Tarn lies, only 25 feet above the level of Windermere—Blelham Beck flowing in from it.

No important stream enters on the remaining 3 miles of the west side, which from Wray Crag becomes rocky and steep, the headlands, as a rule, being crags showing clear marks of ice-action. The slopes are thickly wooded, so that the true nature of the land is not readily seen. But from Woodclose Point southward to the end of the Northern Division, the gradient of the lower 200 feet of hillside increases steadily from 1 in 5 at the north to 1 in $1\frac{1}{4}$ at the south. The coast, for all this distance, runs parallel to the higher contours, and has scarcely any indentations not shared by them.

From Waterhead southward the east coast of the Northern Division forms a series of bays and headlands, the latter frequently being low crags; but the land behind is of much gentler gradient, and less wooded than on the western side. Holbeck comes in just south of Lowwood, on a small but prominent delta. From Waterhead to Lowwood, a distance of about a mile, the gradient of the land sloping up from the lake averages 1 in 6 for the first 200 feet, but further south the contour-lines sweep back up the valley of Troutbeck, and the broad delta of that stream borders the lake for a mile, with a nearly level meadow. South of this delta the shore becomes a little steeper, but although broken by knolls like Miller Brow, the average gradient for the first 200 feet is only 1 in 11 between Millerground Landing and the point opposite Rough Holme, at which we place the limit of the Northern Division.

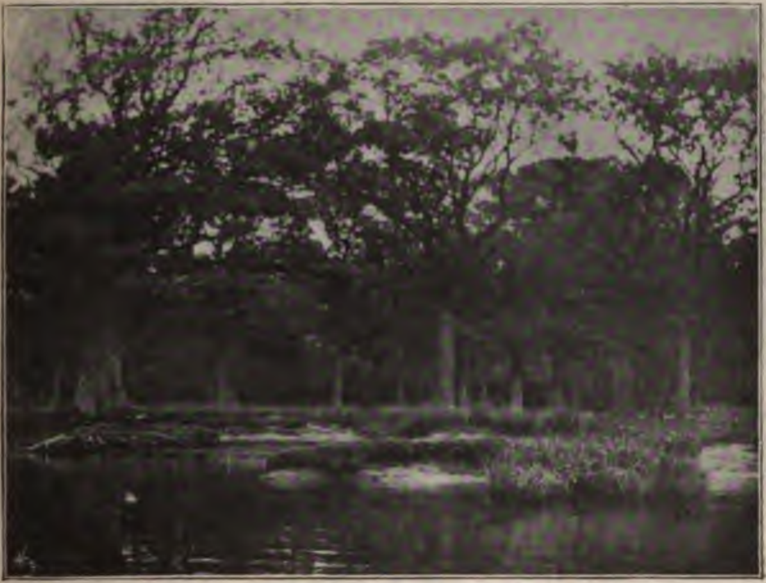

FIG. 19.—WAVE EROSION ON TROUTBECK DELTA.
(*Photograph by Mr. John Thomson.*)

Along the edges of the Troutbeck delta, which is grass-covered to the water, and at several other points, the shore-line is very ragged, being fretted into a series of irregular little bays with miniature cliffs, one or two feet high, of alluvial sediments evidently cut by waves. (Fig. 19.) No such formations were noticed on the western side, and they are evidently due to the action of the prevailing south-westerly wind, and are similar to the bays of the east shore of Bassenthwaite.

The Northern Division of Windermere forms one deep and uniform basin, the isobaths of which follow the coast-line faithfully, clinging most closely to it along the uniform western side, and along the faces of Holbeck and Troutbeck deltas. Two instances occur in which the isobaths down to 150 feet indicate branches or sublacustrine valleys running into the main depression. One of these is a deep channel passing through Pull Wyke in line with the valley of the present stream, a remarkable instance of sedimentation not having yet effaced primitive structure, comparable in some ways with the depression of Howtown Wyke in Ullswater, but more pronounced. Section 1 is drawn from south to north across the mouth of Pull Wyke. The other instance occurs on the east coast, south of Ecclerigg Crag, where there is a sharp inflection of the isobaths toward the north side of the square bay, which is bounded on the south by the Troutbeck delta. A similar though less pronounced inflection of the shallower isobaths is shown in the bay south of the Troutbeck delta, and it is possible that these may be indications of the primitive outline of the basin when Troutbeck

FIG. 20.—THE HEAD OF WINDERMERE FROM THE LAKE.
(*Photograph by Mr. John Thomson.*)

entered a wide bay, which it has now filled up, and the inflections represent the angles between the pyramid of river-borne detritus and the original wall of the basin. One peculiarity of this basin is that the slope at the head is nearly as steep as the slope at the sides. It is one of the steepest ramps in the Lake District, resembling that of Buttermere. Depths over 100 feet are found along 3½ miles, this being the longest deep depression in the Lake District, though little longer than that of Ullswater. Of this, an area 3 miles long and nearly one-third of a mile wide is below sea-level. From off Wray Crag to off Pinstone's Point, the deepest part of Windermere forms a curved trough exceeding 200 feet in depth for a distance of one mile, and nearly one quarter of a mile in breadth. This plain lies in the centre of the lake, and is fairly flat, the deepest sounding we obtained being 219 feet. Section 2 gives the best impression of its profile, showing the greater steepness of the eastern slope. The area beneath 200 feet is 107 acres.

The slopes of the deep basin are interesting when compared with those of the valley walls. Off Wray Crag the gradient from the surface down to 200 feet is 1 in 6, and this, except where the comparison is made unsatisfactory by the occurrence of small shallow bays, grows gradually steeper, until off Pinstone's Point it is 1 in 3, the steepest observed. These gradients of the slope are steeper than those of the bordering hills, and where the latter grow steep to the south, the sides of the lake-basin gradually flatten out. On the eastern side the sublacustrine slope from Down's Wood to Ecclerigg Crag, along the whole length of the depression, averages 1 in 6 down to 200 feet; this being very much steeper than the slope of the hillsides.

Toward the Island Division the deep trough of the northern division keeps near the western shore. Section 3, from Slape Scar to Rough Holme, shows this.

The Island Division forms a plateau rising to within 25 feet of the surface of the water, and completely isolating the northern and the southern troughs. An upheaval of only 12 feet would connect Belle Isle, the largest island in the Lake District, with the shore at Bowness on the east side, and through the islets known as the Lilies of the Valley with the west side, thus separating the lake into two. Such an intermediate rise might have enabled the Greta to separate Derwentwater from Bassenthwaite.

The islands are all low and rather flat, Belle Isle being completely surrounded with stones, like the islands of Derwentwater, but also protected by large boulders dropped irregularly, especially round its northern end. The smaller islands to the north-west, Hen Holme, Lady Holme, and Rough Holme, show masses of rock in many cases strongly glaciated from the north. The 25-feet isobath runs from Rayrigg Wyke on the east, round the north and west of Rough Holme, past the west of Lady Holme and Hen Holme, and the north of Haws Holme and

Thompson's Holme to Bass How. The shoal on which the islands stand is not so clearly or simply defined on the south, where the basin of the Southern Division cuts into it on two sides. No streams of importance enter this division, except Mill Beck in Rayrigg Bay; and it is interesting to notice that along the western edge of the lake, from Bass How to the Ferry, the hill-slopes of the Claife Heights are the steepest round all Windermere, and the water beneath them is the shallowest; while on the eastern side the hill-slopes are very gentle up to a height of 300 feet.

The Southern Division of Windermere bears a close superficial resemblance to Coniston Water, with which it runs parallel. It tapers gradually from a breadth of half a mile below the Ferry, until at Lakeside it merges imperceptibly into the outflowing river Leven. At the Ferry near its upper end the breadth is halved by the sickle-shaped promontory on the west shore on which the Ferry Hotel stands, and Ferry Neb on the east. Both coasts are minutely diversified by rocky headlands and bays. On the east side the only large promontory is that at Storrs, off which there are numerous reefs. South of that the coast for 2½ miles is very regular, and the hills rise steeply; then a series of small rocky headlands and bays, with islands lying off them close to the shore, is met with. On the west side the headlands and bays are larger and more numerous. Wanefell Beck comes in on a small delta opposite Storrs Point, and Cunsey Beck, carrying the drainage of Esthwaite Water, forms a more extensive delta, off which is the low island of Ling Holme; a quarter of a mile to the south of it Rawlinson Neb projects, possibly a rocky islet naturally reclaimed, forming now the most prominent headland on its side of the water. To the south the coast runs in sharp bays and abrupt cliffy headlands, often with rocky islets and submerged reefs projecting from them.

Depths exceeding 25 feet run from this basin past the Ferry up both sides of Belle Isle, and in the centre of the space marked off by the south end of Belle Isle, Cockshot Point, and Ferry Neb, there is a small patch over 50 feet with one sounding of 57 feet. For a mile below the Ferry a great bank with depths less than 25 feet occupies the middle of the lake, bearing the small stony island of Ramp Holme, and several shoals which are buoyed for the safety of vessels. The water close to the east shore is very shallow, but a narrow channel separates it from the main portion of the shoal. Depths over 50 feet occupy a channel about 100 yards wide, which, commencing off Ferry Head, runs south close to the west shore, and spreads out to nearly the full width of the lake at Storrs Point. This channel suggests the remnant of an old river-valley by its narrow and sinuous course. The form of the shoal is well brought out in Section 4 from Jemmy Crag on the west to the opposite side. The isobath of 50 feet continues to run very close to the east coast, disregarding the minor inequalities and running outside all the islets. It keeps much farther out from the west coast except off Black Hole in the south, where deep water comes close up to the rocks. Soundings of 50 feet cease half a mile from the outlet of the lake. Along the axis the Southern Division exceeds 100 feet in depth for a length of 3½ miles from off Storrs Point to off Ringing Crag, nearly a mile from the outlet, and 2 miles of this stretch is deeper than 125 feet, the greatest depth found in the southern division being 144 feet. All the isobaths as a rule remain parallel, but the gradient of the lateral sublacustrine slopes is everywhere more gentle than on land. The average gradient from the surface down to 100 feet on the east side is 1 in 3, and on the west side 1 in 6. Section 6 shows the profile across one of the deepest parts of the basin at a point where the steepest slopes and the flattest bottom are found, the gradient on the east side here being 1 in 1·5 and on the west side 1 in 3. Section 5 is more characteristic of this basin.

The deposits obtained from Windermere were in some respects of special interest. In the deepest water of both the northern and southern basins the mud was of very fine consistency, minutely granular and brown or yellowish-brown in colour. In the shallower water stiff clay was frequently found, often mixed with very small pebbles, and this clay varied in colour in different localities, being sometimes bright yellow, occasionally red or chocolate-coloured, and once or twice salmon-colour, or even white.

Two sets of serial temperature soundings were made in the deepest water of the northern and southern basins respectively. In the former (September 5) the depth was 198 feet, and the temperature, which was 64° on the surface, fell with almost uniform rapidity to 44·4° at 60 feet, and then more gradually to 41·9° on the bottom. In the southern basin, on September 7, the depth was 120 feet. The surface temperature was 62·4°, and at 30 feet it was practically the same, 62·3°; then it fell rapidly to 46·4° at 60 feet, and gradually to 44·8° at the bottom. At depths below 60 feet it thus appeared that the shallower basin contained water 3° warmer than that in the deeper basin at equal depths.

The surface of Windermere was fixed as of the altitude 128·0 feet above sea-level by the officers of the Ordnance Survey on July 4, 1889, the height previously determined having been 133·7 feet. On September 5, 1893, we found by levelling from a bench-mark that the surface of the water was 129·7 feet above ordnance datum, or, since the lake rose a few inches on account of the heavy rains during the last days of our work, the altitude of 130 feet may be safely taken as that to be used in placing the isobaths on the ordnance maps.

Accepting this height, we can see that if the water were drained off down to sea-level, the valley of the Brathay-Leven river would contain three narrow lakes separated from each other. The northern lake would measure 3¼ miles in length, about a quarter of a mile in breadth, and would be 90 feet deep at its deepest. Three and a half miles south of the end of this lake, and on the southern side of the Belle Isle plateau, the middle lake would be 1 mile long and 350 yards wide, with a maximum depth of 14 feet, and a quarter of a mile south of it a shallow pool half a mile long and 300 yards wide would represent the southern lake.

XIII. Conclusions.

An abstract of this paper has already appeared in the *Geographical Journal* for September, 1894 (vol. iv. pp. 237–246), together with the remarks made on the paper when it was presented to the Royal Geographical Society. The suggestions made on that occasion by Mr. Heawood present so clear a generalization of many of the facts, that they are reproduced at the end of this summary.

The facts dwelt upon in detail for each of the lakes considered are summarized in the three following tables. Table I. gives the numerical statistics for the ten lakes under consideration with regard to length, maximum and mean breadth, ratio of average breadth to length, elevation of the surface of the water above sea-level, the maximum and mean depth, the ratio of mean to maximum depth, superficial area of the water-surface, estimated volume at the time of observation, total drainage area of each lake, and the ratio of that area to the size of the water-surface. For the convenience of readers who may be unfamiliar with the British system of measures, Table II. is given with all the measurements repeated in metric units; the ratios, which do not depend on the units adopted, are not repeated. As this paper is merely a record of work done on a single group of lakes, and not in any sense a treatise on limnology, I have not attempted at present to bring our work into

TABLE I.—STATISTICS OF ENGLISH LAKES.

Name.	Length miles.	Breadth, yards.		Mean breadth per cent. of length	Elevation of surface above sea, feet.	Depth.			Area, sq. miles.	Volume, million cubic ft.	Drainage area of land.	
						Feet.		Mean per cent. of max.			Total in sq. miles.	Ratio to area of lake.
		Max.	Mean.			Max.	Mean.					
Windermere	10·50	1610	950	5	130*	219	78½	36	5·69	12,250	88·65	15·6
Ullswater...............	7·35	1100	827	6½	476	205	83	40	3·44	7870	55·95	16·3
Wastwater	3·00	880	650	12	200*	258	134½	52	1·12	4128	18·64	16·7
Coniston Water	5·41	870	600	6½	143*	184	79	43	1·89	4000	23·34	12·4
Crummock Water ...	2·50	1000	700	16	321	144	87½	61	0·97	2343	16·80	17·3
Ennerdale Water ...	2·40	1000	800	19	368	148	62	42	1·12	1978	16·95	15·1
Bassenthwaite Water	3·83	1300	950	14	223*	70	18	26	2·06	1023	91·51†	44·2
Derwentwater	2·87	2130	1270	25	244*	72	18	25	2·06	1010	31·83	15·4
Haweswater	2·33	600	405	10	694	103	39½	38	0·54	589	11·20	20·7
Buttermere	1·26	670	620	28	329	94	54½	58	0·36	537	6·50	18·0

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* Depths determined at time of sounding; other depths ± 2 feet.

† Excluding Derwentwater and Thirlmere drainage areas; including these = 131·2 square miles.

relation with that of foreign workers. The data are presented simply as they were ascertained, and arranged in a convenient manner for subsequent discussion. Table III. gives a set of ratios calculated from the measurements of areas included between successive contour-lines made at the Ordnance Survey Office. It affords some remarkable contrasts with regard to the arrangement of depth in different lakes. Derwentwater and Bassenthwaite being of the same area, average and maximum depth are strictly comparable; but Derwentwater has a far smaller area less than 10 feet deep than Bassenthwaite, showing much more gentle marginal slopes in the latter. The flat-floored, trough-like form of Buttermere, Crummock, and Wastwater is beautifully brought out by the low ratio of shallow water and the very large percentage of area at great depths.

TABLE II.—STATISTICS OF ENGLISH LAKES IN METRIC UNITS.

Name.	Length, kiloms.	Breadth, metres.		Depth, metres.		Height of lake surface above sea, metres.	Area, sq. kiloms.	Volume, million cubic metres.	Total drainage area, sq. kiloms.
		Max.	Avge.	Max.	Avge.				
Windermere	17·0	1475	869	66·8	23·8	39·6	14·79	347·0	230·5
Ullswater	11·8	1005	756	62·5	25·3	145·0	8·94	223·0	145·5
Wastwater	4·8	805	595	78·6	41·0	61·0	2·91	117·0	48·5
Coniston	8·7	795	549	56·1	24·1	43·5	4·91	113·3	60·7
Crummock	4·0	914	640	43·9	26·7	98·0	2·52	66·4	43·6
Ennerdale	3·8	914	732	45·1	18·9	112·5	2·91	56·0	44·1
Bassenthwaite......	6·2	1190	869	21·3	5·5	68·0	5·35	29·0	237·9
Derwentwater......	4·6	1950	1160	22·0	5·5	74·5	5·35	29·0	82·7
Haweswater	3·7	549	370	31·4	12·0	211·5	1·40	16·7	29·1
Buttermere.........	2·0	613	567	28·6	16·6	101·0	0·94	15·2	16·9

TABLE III.—ENGLISH LAKES. PERCENTAGE OF SUPERFICIAL AREA COVERED BY DIFFERENT DEPTHS OF WATER.

LAKE. Feet	0–10	10–25	25–50	50–100	100–150	150–200	200–250	Over 250
Metres (approx.)	0–3	3–7·5	7·5–15	15–30	30–45	45–60	60–75	75
Derwentwater	35·4	45·0	13·5	6·1	—	—	—	—
Bassenthwaite	43·2	30·8	20·1	5·9	—	—	—	—
Buttermere ...	22·6		15·2	62·2	—	—	—	—
Crummock ...	16·0		11·0	20·0	53·0	—	—	—
Haweswater ...	41·9		22·1	34·3	1·7	—	—	—
Ennerdale......	39·8		12·8	15·2	32·2	—	—	—
Coniston	25·9		11·2	23·7	30·0	9·2	—	—
Ullswater	17·6		17·6	28·8	18·6	15·8	1·6	—
Windermere...	42·0			21·6	23·0	10·4	3·0	—
Wastwater ...	23·0			16·0	16·6	14·1	16·6	13·7

In these tables all the lakes of the district have been considered, except the mountain tarns, the transitional forms between tarns and valley-lakes, such as Grasmere, Esthwaite, and Hayes Water, and Thirlmere. The omission of Thirlmere, which is a true valley-lake, was made necessary by the fact that it was in the act of being converted into a half-artificial reservoir by the Manchester Water Works while our survey was being made, and, its level being in course of alteration, no satisfactory survey was possible. Nor would the lake in its present altered condition, to which it has not yet become adjusted, be comparable with the purely natural basins we have been considering.

Excluding Thirlmere and the tarns, we may conclude that there are in the English Lake District two main types of lakes, the shallow and the deep. The former includes only Derwentwater and Bassenthwaite, the broadest of all the lakes; they only average 18 feet in depth, and their average depth is only 25 per cent. of their maximum depth, a smaller ratio than for any other lakes. The bed of these lakes may be roughly described as an undulating plain, grooved and ridged into shallow hollows, and low shoals running parallel to the long axis of the lake. The fact that these lakes are separated by a strip of alluvial ground so low that their waters may mingle in heavy floods, shows that they may in some ways be viewed as a single lake, and the configuration suggests that they may have been shallowed by glacial accumulations.

The second, or deep type, the shallowest of which has an average depth of 40 feet, and in which the average depth varies from 36 to 61 per cent. of the maximum depth, showing a steep-sided character, comprises all the other lakes. Ennerdale, however, combines the characteristics of the two, conforming to the deep type in its upper, to the shallow in its lower reach. The deep lakes are long, narrow, sometimes winding like Ullswater, or slightly curved in outline like Wastwater and Haweswater. The most characteristic lie in long narrow valleys with steeply sloping sides, and the slopes are continued under water with almost equal steepness, in some cases with greater steepness, and terminate in a nearly flat floor. The typical form of this class of lake is thus a steep-sided flat-bottomed trough, diversified along the slopes by the still steeper conical mounds of *débris* thrown down at the mouths of streams. Yet, while conforming to these types, each lake presents a certain individuality which distinguishes it from every other.

On a map of the Lake District on which the boundaries of the drainage areas are marked (see Map I.), the position of the lake with regard to the region dipping in towards it is somewhat remarkable. Thirlmere, Buttermere, and Crummock Water are fairly symmetrically situated in the centre of their drainage areas. Haweswater is much nearer the right than the left-hand side of its tributary area, looking down the lake. On the other hand, in the case of Windermere, Coniston Water, Wastwater, Ennerdale, Derwentwater, Bassenthwaite, and less clearly in Ullswater, the lake lies close to the watershed which bounds it on the left side. This shows a shorter land-slope and smaller drainage on the left than on the right, and it is interesting to notice that the axis of maximum depth almost always follows exactly the same plan lying near the left bank in almost all the lakes of the last group, and running almost along the centre of Buttermere and Crummock.

Mr. Heawood makes the following observations on the results of the work in which he was my colleague, and of the harder parts of which he did more than his share.

"One point on which I should like to touch very briefly is the position of the deepest basins relatively to the general form of the valleys in which the lakes occur. In the case of lakes dammed back, whether by landslips or glacial deposits, we should expect to find a gradual deepening from above downwards in accord with the slope of the valley. Now, in their present condition, at any rate, this is not the case at all with the English lakes. Considering Derwentwater and Bassenthwaite as properly forming a single basin, and the same with Buttermere and Crummock, I find that in four of the principal lakes the greatest depression occurs in the upper half, in three it is central or but slightly below the centre, and in one case only, that of Buttermere and Crummock, does it occur decidedly towards the lower end, but even here an important depression is found quite at the upper end. If we search for some definite rule which governs the position of the deep basins, there seems ground for the assertion that they occur in association with the highest parts of the shores, or, as I should rather put it, with the points where the high ground slopes most steeply to the water. To give only one or two instances: abreast of the deepest part of Derwentwater the 1000-feet contours on the two shores are only 1¾ mile apart; they afterwards widen out to over 3 miles, but again close in to the former distance just where the deepest part of Bassenthwaite occurs. In Buttermere and Crummock, the deepest parts respectively are just between Robinson and High Crag, and between Grasmoor and Mellbreak; and in Wastwater between the highest point of the Screes and Middle Fell, where the 1000-feet contours are only 1¼ mile apart, while at the lower, shallower end they have widened to nearly 2 miles. The reason would seem to be, not that the materials from beneath the depressions have gone to make the mountains, but that opposite the steep slopes the lakes have not been filled up by the wear and tear of the mountain sides to anything like the same extent that they have elsewhere. The fact that the shores recede, of course means that the lake receives the drainage of a larger area of country, the products of the denudation of which eventually find their way to it, and, in accord with the above-mentioned position of the deep basins, we find that hardly any important streams empty themselves into them. As to the question how far the shallowing can be due to sedimentation, although, from the very steep angles at which the deltaic material slopes into the water, it might appear that the effect cannot reach far from the shore, we must consider that this material is simply shingle which is pushed out into the water, and that the fine matter held in suspension behaves very differently. It seems natural to suppose that even when once deposited it is not finally at rest, but that, under the combined influence of currents and gravitation, a gradual movement out into the deepest parts would take place. Gravity then ceasing to act, there would be no tendency to further shifting. If the above explanation is correct, the shallowing at the lower ends of the lakes would be a natural corollary of their radiate arrangement, which, to some extent, involves a progressive widening of the drainage areas from the centre outwards. The idea also that the original form of the valleys is best preserved in the deep basins, is borne out by the fact that it is just here that the correspondence of the slopes above and below the water is most marked.

"The fact that the lakes as a whole reach just as far and no further than the beginning of the more level country which skirts the district, is in one way merely an extension of the principle of the shallowing at their lower ends. The same fact also shows that they are not held back by anything like a dam thrown across a narrow valley, for in some cases we should have to traverse the level country for miles before reaching a point as low as the deepest parts of the lakes, in several cases considerably below sea-level."

ANCIENT TRADING CENTRES OF THE PERSIAN GULF.

I. SIRÁF.

By Captain ARTHUR W. STIFFE, R.I.M.

I THINK an account of this ancient city, which, in the tenth century, was the chief emporium of the trade with the far East, may be of interest. Its very name is now unfamiliar, the actual site was long forgotten, and it has been visited by very few persons. Dean Vincent, who has been followed by others, notably Sir W. Ouseley, supposed its site to be opposite the island of Kais, or Kis, where, however, no ruins exist. Morier refers to ruins at Tahiri (the actual site), and mentions sculptures with the Persepolitan character, which have not been found subsequently. He does not appear to have visited the place, but to have written from hearsay. Captain Brucks, I.N., the first surveyor of the Persian Gulf, calls them the ruins of a "Portuguese town." The first person who identified the site appears to have been Captain Kempthorne, I.N., who visited Tahiri in 1835, and gave an account of what he had been able to see, during a visit of a few hours, in the Bombay Geographical Society's *Proceedings* of 1856. It was next visited by Commodore Ethersey, also of the I.N., about 1855 or 1856, but he published no account of his visit. His notes on his discoveries are in my possession. It was next visited by Captain

Constable, I.N., and me, in the surveying brig *Euphrates*, on October 17 and 18, 1857, and the following description is compiled from the notes then made by us. We visited the whole of the ruins, as far as time would permit. Since that time it has, so far as I am aware, been only visited once, by the telegraph-ship, on which occasion one of the tombstones was brought away, and is now in the British Museum. A similar one, brought by Kempthorne, is in the Bombay Asiatic Society's Museum.

The modern village of Tahiri is a small village inhabited by fishermen, chiefly pearl-fishers, of Arab descent, 200 to 300 in number. It is an insignificant place, and has a small square fort on a little hill at the west end, which is in lat. 27° 39′ 36″ N., long. 52° 20′ 40″ E., standing on the shore of the Persian Gulf, at the foot of a range of mountains rising to a height of near 5000 feet, and running parallel to the coast. This range appears to form a great anticlinal ridge, and is composed of limestone with much gypsum. Between these and the sea is a lower ridge, from 500 to 600 feet high, of more recent strata which dip to seaward and end abruptly inland in a precipitous escarpment, having been apparently disturbed and broken through when the great range was upheaved. It is on the slopes of this lower range, which rise up from the coast, that the ruins are situated. This coast ridge has also been broken through by transverse precipitous ravines, due apparently to torrents from the high mountains, aided perhaps by fracture of the strata. These ravines are the passes into the interior, and two of them, at least, have been fortified by walls and towers, the remains of which are still to be seen. Farther up in the mountains some of these passes have to be climbed by the aid of ropes. The situation is thus very picturesque; small patches of cultivation and date plantations are scattered about the lower ground, but the great mountains are rugged and precipitous, and appear, from a distance, quite destitute of vegetation. On a nearer approach many shrubs and plants are seen scattered over their surface, especially in the watercourses, where they often grow thickly. The present inhabitants know nothing of the history of the ruins, and could not be persuaded we had not come to dig for and take away treasure.

The ruins of the old city of Siráf lie to the west of the village, and extend for perhaps two miles along the shore. They are mere heaps of rough masonry; foundations *in situ* are to be seen, especially where cut through by water-courses, or exposed by the action of the sea, for the ruins extend from the water's edge far up the slope of the foothills. The water-courses through the city have been walled in, where required. Among the *débris* are numerous ruined water-cisterns, constructed in the style still prevailing in the country—oblong chambers excavated in the ground, lined with cement or gypsum, and arched over to prevent evaporation. The arched coverings have mostly fallen in, and the cisterns are more or less choked up. There are also many wells among the heaps of *débris.* The whole extent of the ruins is strewed with broken pottery, including many fragments of Chinese porcelain.

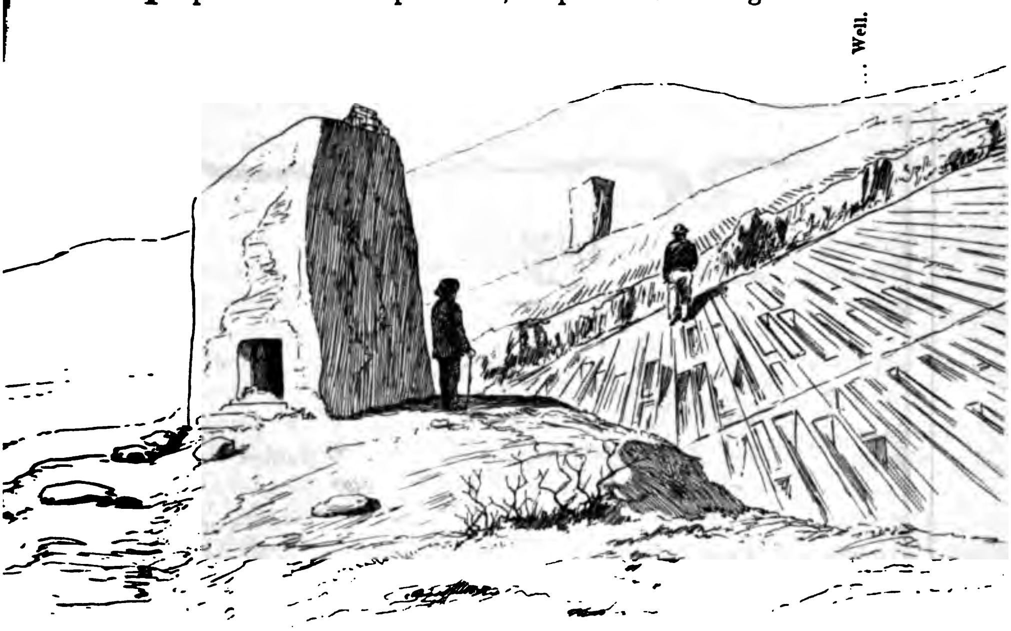
The only building standing at the time of our visits was a large mosque of well-cut stone, in a ruinous condition, the roof or dome having fallen in. It appears to have been a handsome building, with pointed windows and doors, and it stands on the low hills near the sea. Under the building is a large chamber or cellar, now tenanted by crowds of bats.

Close to the mosque is one of the kanáts, or underground water-conduits, so common in Persia from time immemorial up to the present day. The shafts of this one are circular, about 4 feet in diameter, and 20 feet deep, distance apart about 50 yards. There was no water in it.

There are also many monolith tombstones or grave-covers of arched form, with Cufic inscriptions; they are in good preservation, and many are ornamented with carved nobs, borders, and flowers. I learn the date on the one in the British Museum, already referred to, is equivalent to A.D. 991.

These are the principal remains of the Mohammedan city. The following, I suggest, are referable to pre-Mohammedan times; they lie inland of the part described above. The precipitous faces of the ravines leading through the foothills are studded with excavated chambers, no doubt tombs, mostly so high up as to be inaccessible without ladders, but some of the lower ones could be got at by climbing. The entrances are small, about 3 feet by 2, but they widen out inside often into two or more chambers, so that one cave could be used for several bodies. Those we entered contained much fine dust and crumbling human bones; they had been cemented inside.

The most curious and interesting of the old remains are on the slope of the hillside after passing through the fortified ravine or first pass; the sketch attached gives an idea of the appearance of this part. It shows the hillside divided by a great cleft or ravine. The whole hillside appears to have been denuded for about half a mile square of the upper stratum of sandstone, leaving pillars *in situ* here and there (like the "deadmen" of modern excavating work), which show the thickness of the layer which has been removed. The sketch shows two of these pillars; the dimensions of the largest are 9 by 6 feet, and 12 to 14 feet high. On each side of the ravine a flight of low broad steps has been cut in the rock, rendering the ascent easy; and the hillside is honeycombed with troughs, either sepulchral, or in which the dead were exposed before burial. They vary from 9 to 2 feet in length, by 1½ to 2 feet wide, and 1 to 3 feet deep, and lie close together, divided only by a thin partition of rock. No traces of any covers were found, but some of them had a small ledge left all round a few inches below the top, as if to support a lid. This rock is a coarse conglomerate. The sketch gives an idea of their arrangement and of the steps; the figures give a rough scale. The largest pillar, in the foreground of the sketch, contained a chamber cut in the rock, evidently a tomb, the entrance about 2 feet square, giving access to a rectangular chamber about 7 by 4 feet. On the top of this pillar were some remains of masonry. There are many wells on this hillside, those higher up the hill being deepest. We sounded one of these, which was 204 feet deep, with 36 feet of good water. They are from 2 to 3 feet in diameter, and some are oblong, about 1½ by 3 feet. They are smoothly cut, and I noticed notches cut inside, apparently for footholds, to enable a descent to be made. Some had a low parapet wall on the uphill side, to prevent soil being washed into them. This wall is not built, but some of the upper stratum of rock has been left in the required position, and cut into shape at the time the rock was removed. No inscriptions or other remains were found in this part.



ROCK PILLARS AND TOMBS, SIRÁF.

The little plan shows the site of the ruins and the modern village.

I will now add the little I have been able to trace of the history and trade of this wonderful place. In the 'Bibliotheque Orientale' it is stated that Siráf was founded by "Caicaous" of the Caianian dynasty, supposed to be cotemporary with David. The first account of the place I have found, is in the fragment of two Mohammedan travellers of 851 and 867 A.D.* (The misprints and mistakes of names in the English translation of 1733 are numerous.) In this it is referred to as a long-established centre of traffic, and I propose to quote the at some length, although it has been often commented on. Th the two, Soleyman, was a traveller by sea and land, and by evidence, such as some of the habits of the Chinese—the wi from rice, etc.—had probably visited the places he describes, and intelligent observer. He notes, for instance, *inter alia*, the co of the tides with the moon. The distances he gives in the fairly accurate, as from Siráf to Basrah,* "whence the goods o are shipped at Siráf," 120 leagues, and to Maskat as about 200. a league as 3 statute miles, the distances are really about 118 respectively. He describes the voyage to China. On the voya

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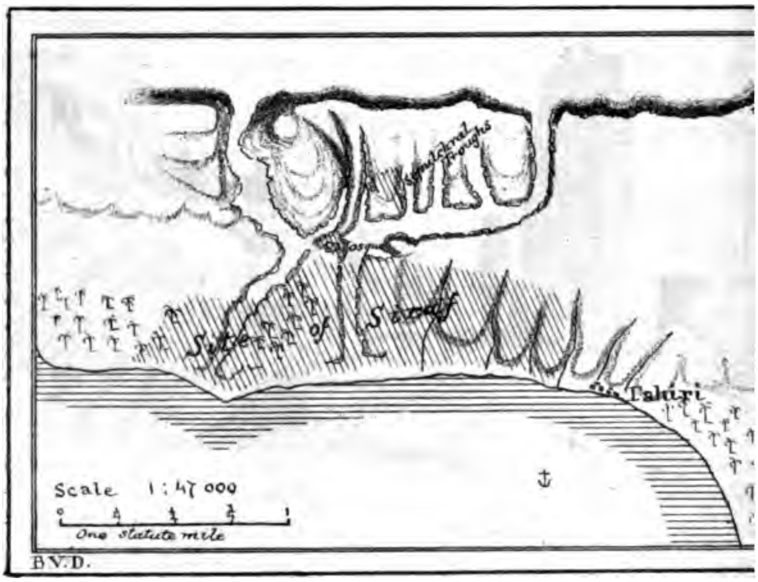
* Translated by E. Renaudot in 1718, from an incomplete manuscript written in 1173.



SITE OF SIRÁF.

Siráf to Maskat, he mentions, on the east coast of the sea, a plac Nafif Bani al Safak, which I cannot identify, and an island call Kahowan, an old name for that now known as Kishm. He the "In this sea are two rocks called Oman, and a narrow strai Dordur, between two rocks, through which ships often venture but the China ships dare not. There are also two rocks, called and Howair, which scarce appear above the water's edge." names I do not recognize, but the description refers to the i Cape Musandam, and the strait there known as the Fakk-a They then come to a place called Shihr Sahar Oman, evidently in the country of Oman, formerly an important place, and th

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* Basrah was built about 636 A.D.

Maskat. This place he correctly describes as in the "extremity of the province of Oman," and says "the ships take in water there, which is drawn up from wells, and are here also supplied with cattle." This would do for a description of the present day: the small cattle of Oman are celebrated. From Maskat the ships stood apparently straight for India, across the sea, first touching at Kulam-Malay (this name is misprinted in 'Kerr's Collection'), evidently Quilon, "which is a month's sail from Maskat with a fair wind;" and thence proceed to China, where the Siráf merchants had been long established, as it is not spoken of as a new route. I do not follow the route beyond Maskat, but it is an interesting question whether they were provided with the compass, or merely guided by the direction of the monsoon winds and by the stars.

The second "Mohammedan," Abu Zeid, or Sayyid (either 867 or 877), is a commentator on the first; he appears to have been a merchant living at Siráf. He states that Siráf traded with the Red Sea also, and that the ships did not go further than Jedda, "whence their cargo is transferred to Cairo by ships of Kolzum, where the sea ends." Kolzum would appear to be Suez, as he continues, "The sea at this place is divided by a strip of land, which God hath fixed as a line of separation between the two seas."

Ebn Haukal, called al Istakhri, who wrote in the first half of the tenth century A.D.,* gives an account of the place. He says it is one of the greatest cities of Fars, well peopled, and about as large as Shiraz, from which place it is distant 60 farsang (about 200 miles). "Siráf has three oratories; here are wealthy merchants, who expend 30,000 dinars [about £12,000] on their houses. There are not any trees immediately about Siráf, the climate is warmer than any of those other towns (in Fars). Fruits and water are afforded by a mountain on the east of the city called Jem." (While at Tahiri we were told that supplies are still brought from a place beyond the mountains called Jem.) "It is so lofty that the air on its summit becomes like the climate of the cold region (Sardsir). In its valleys are found stones like a ruby, but liable to changes of colour. The people of Siráf devote their whole time to commerce and merchandize. I saw myself at this place persons who possessed four thousand thousand dinars [say £1,500,000], and there were some who had more, and their clothes were like those of hired labourers. A merchant of Siráf had passed forty years at sea, never leaving his ship during that time (!). At Siráf they abound in marine productions and commodities brought by sea, such as aloes, ambergris, camphin, pearls, canes, ivory and ebony, pepper, sandal; and various kinds of drugs and medicines are sent from that place to all quarters of the world. The houses are built of teak-wood or wood from Zanguebar, and of several stories."

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* 'The Oriental Geography of Ebn Haukal.' By Sir W. Ouseley. 1812.

Yakút (al Rúmi), whose book was written in A.D. 1218,* visited Siráf, which had then declined, and says that it was formerly the port of the merchants coming from India, and that they call it Shila. This latter name is now that of a village about 4 miles to westward of Tahiri, and is obviously a modification of the old name. He saw at Siráf "remains of remarkable edifices and a fine mosque," and says, "it lies in the hollow of a high mountain, has no port, and vessels have to go to a place called Nabed, two farsakhs distant." This is doubtless Naband, about 17 miles to the eastward, where there are also some ruins, which were not visited by us. He then quotes Abu Sayyid, the "second Mohammedan," and observes, "Such it may have been in his lifetime, but since the isle of Kais has been colonized, Siráf has fallen from its ancient splendour." He then quotes al Istakhri, the author last referred to, almost verbatim, and concludes, "It is difficult to admit as true the description of this author, but God knows the truth." This last remark implies polite disbelief on his part, and it is strange that in less than two centuries the place had so decayed that its history and greatness were alike forgotten and discredited. As he visited the place himself, we may accept his account.

Abulfeda † (1274–1331) places Siráf on the coast between Jannabah (Ganáwah) and Najiram (? Gerun, the old name of Hormuz Island), and quotes the account of Ibn Haukal, apparently as if it referred to a state of things then existing, instead of to a long-past period. He does not give it as a quotation, but the statement in his account of the "merchant spending 30,000 dinars on a house" seems to point clearly to that source. He does not say he was ever there, and I mention his account only to discredit it.

Ibn Batúta ‡ (1325–54) visited Kais, which he confuses with Siráf, and gives no account of the latter place. He describes correctly the pearl fishery as carried on now, but states that there are some who remain under water one or two *hours*, which one may charitably hope is a slip of the pen for *minutes*. Further on I hazard a conjecture as to the reason of the mistake. The above are the only references I have found to this once flourishing place. Sir William Ouseley says Siráf § decayed after the close of the Dilamite Government, at which time Keish (Kais) became predominant. This would fix the middle of the eleventh century as the date of its decline. There is a curious legend about the island of Kais, which I hope to deal with in the history of that island; but it appears to me very probable that, in the civil wars after the close of that dynasty, under the Siljuks, or still more possibly at the Tartar conquest in 1202–26, which was accompanied by such widespread devastation, the inhabitants of Siráf may have been driven to abandon their city *en masse*, and establish themselves on the island for safety, which would account for the rapid rise of that island to importance, and perhaps for Ibn Batúta's account.*

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* 'Dictionnaire geogr. de la Perse.' By C. Barbier de Meynard. Paris: 1861. (From Yaqout.)

† 'Geogr. d'Abulfeda,' traduit par M. Reinaud. Paris: 1848.

‡ 'Voyages d'Ibn Batoutah.' Translated by C. Defrémery. Paris: 1853.

§ 'Travels, etc, in 1810-12.' London: 1819.

There appears no doubt that from the remotest date they traded with Zanzibar, the Red Sea, India, and even China. Cosmas (530-550 A.D.) mentions an ambassador from the Persian king arriving at Ceylon in a ship from Persia. As regards the "ships" used in those distant voyages, I gather from various references that the planks were fastened with coir, no nails being used, a practice still common with small vessels in the Gulf. They carried one large lateen sail as in the present day, and were only partially decked. Colonel Yule, from the Chinese annals of the seventh and eighth centuries, says that the Chinese ships then came as far as Siráf and the river Euphrates, where they lay at Hira, near Kufa, a long way above the place where Basrah now stands; also that this trade fell off about 878 A.D., owing to dreadful civil wars in China.

THE SOURCES OF THE EUPHRATES.

By WILLIAM FRANCIS AINSWORTH, F.S.A.

It has been hitherto accepted, as an established fact in geography, that the main trunk of the river Euphrates is formed by the confluence of two rivers, to both of which the name of Frat has been occasionally applied, but which are more generally known—the westerly one as the Kara Su, or Blackwater; the easterly as the Murad Su; and the latter, having a longer course than the Kara Su, has also been hitherto looked upon as the most remote tributary, and therefore as comprising the sources of the great river.

But if it could be shown that a second and lesser Kara Su, or Blackwater, and a tributary to the Murad Su, having its origin from a crater-fountain at Nur-shīn, and that that fountain is the outlet of Lake Van, it would establish that the more remote tributaries to that lake would constitute the true sources of the Euphrates.

These tributaries have their sources in the Dumanlu and Tendurek Taghs, and although it is difficult to determine, even with the assistance of Captain Maunsell's admirable map, which of the several tributaries is the most remote, still it is quite certain that they are all, espe the river Koshah, further removed than any tributaries to the M Su, having their sources in the Shahrian Tagh, the Ala Tagh, an Supan or Sipan Tagh, and that they (or one of them) constitut true sources of the Euphrates.

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* Such migrations are on record, as when the inhabitants of Hormuz, the city on the mainland, abandoned their city, and migrated to the island afterwards called by the same name. This happened in the beginning of the fourteenth century, and was owing to the ravages of the Tartars. In 1859 the large town of Kongún, on the Persian coast, was abandoned by the chief and all the people, who took refuge on the island of Shaikh Shoaib, in consequence of a feud with the Deshti chief. The town on the mainland remained deserted for some years.

The peculiar character of the artesian and crater-fountain of shin, situate at the foot of the Nimrud Tagh, and in a valley bet the volcanic group of hills so called and the Antogh Tagh, constit part of the Niphates or snow mountains of the ancients, and separated from Lake Van by a distance of a few miles of plain hills, the latter known as the Tacht Ali, or "The Throne of Ali," a difference of elevation, as proximately determined by boiling- thermometer, of from 800 to 1000 feet, is highly in favour of the jecture that it constitutes the outlet to the waters of Lake Van, as as the source of the lesser Kara Su.

It is scarcely probable, or indeed possible, that in such a cli with an elevation, by boiling-point thermometer, of some 5400 feet a the level of the sea (Dr. Dickson, who accompanied Mr. Consul Br in his exploration of this district, gives as the result of baromet observation, 5469 feet), the evaporation of so great a mass of w constantly fed by numerous tributaries, some of which, as the Ko coming from Bash-Kalah (7900 feet elevation), assume the charact rivers, would suffice to carry off the surplus waters and maintain lake at its present level, yet if we do not admit the Nur-shin cr spring to constitute its outlet, it would have none other as far as i known.

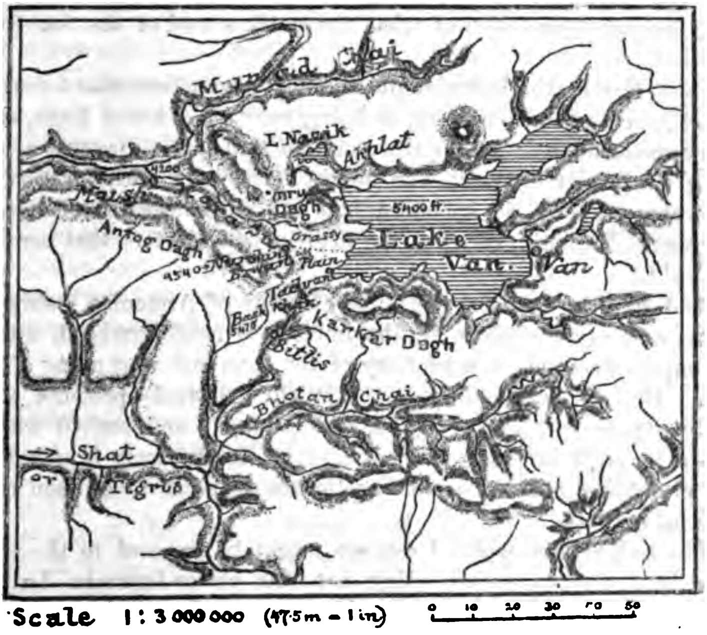
M. Ch. Maunoir, the learned Secretary to the Geographical So of Paris, observes, in his *Rapport sur les Travaux de la Société, etc* 1893, that whilst the point of separation of the waters tributary to Van and to the river Tigris is not *fortement accusé*, or very cl defined, and that the probable point of anterior or olden communic between the two basins is not easily determined, still admits Captain Maunsell's idea, that such communication was intercepted b overflow of ancient lava poured forth from the flanks of the Ni Tagh, can alone explain the present state of things.

This explanation will, indeed, alone account for a host of peculiar which have not as yet obtained the attention which they deserve. an overflow would not only have separated the original sources of Tigris from the tributaries to Lake Van, but it would also have g birth to Lake Van itself—at all events in part—constituting it, as present stands, one vast lacustrine crater.

It has left the southern portions of the lake restrained by a bar volcanic rock which rises at times into hilly ranges, as the Ardost Karkah Taghs, whilst the tributaries to the river Tigris flow from very lips of the protecting wall of rock.

To the south-west the Bitlis Chai, a tributary to the Tigris, flowing from beyond the town which gives to it its name, has its origin, as a mere rivulet (not to be admitted as a possible outlet of the lake, being at the same or even a superior elevation than the lake itself), at Bash-Khan, a handsome Kirwan-Serai, solidly constructed of black lava. The traveller is always on the ascent from Bitlis to Bash-Khan, while all beyond is more or less level plain to Tadwan and the lake.

The Easterns are by no means insensible to these great features of physical geography, and as we have Bash-Kalah, or "The Castle at the Head of the Waters," at the point of separation of the tributaries to Lake Van on the one side, and to those of the greater Zab on the other, so we have a Bash-Khan at the head of the Bitlis Chai.



HYDROGRAPHY OF THE NEIGHBOURHOOD OF LAKE VAN.

Lake Van, thus separated by an overflow of lava from the tributaries to the Tigris, would, by the very force of circumstances arising from the contour of the adjacent country, seek an outlet in the valley of the Kara Su, only that, owing to peculiarities not uncommon in limestone districts as well as in those of igneous origin, the communication would at its outset partake of a subterranean character.

The crater-fountain of Nur-shin, which I first stumbled upon in 1840, must, from the abundance of its waters, have a more or less distant origin, and all the circumstances of the case point to that supply being derived from Lake Van. The waters pour out from a deep circular basin of volcanic rocks, 220 feet in circumference, in two abund streams, over the opposite lips of the crater, each stream being ab 30 feet in width, and both uniting at a short distance to constitute Kara Su. The fountain stands, by boiling-point thermometer, 4540 f above the level of the sea, while the great plain of Mush, watered the Kara Su and the Murad Su, averages an elevation of some 4200 fe

It is curious that Mr. Consul Brandt and Dr. Dickson, who m have passed close to this spring, had not their attention called to The American missionary—the Rev. Mr. Southgate—who also travel this road, makes mention, however, of the tradition of a fountain unknown depth, said to exist on the summit of the Nimrud Tagh, p bably a misinterpretation of what the natives said of the fountain question.

Saint Martin, the historian of Armenia, also notices this fountain the authority of older writers, as being near the Nimrud Tagh, and "very remarkable." It is quite possible that the conjecture as to being the outlet of Lake Van might meet with corroboration fr researches made in the ancient annals and chronicles of Armenia. very name, Nur-shin, seems to be expressive of waters that here co to "light."

Add to this, that the existence of ruins of Armenian habitatio tombs, and other edifices, in the immediate neighbourhood, attest the importance and even sanctity of the spot, and that up to a rec date. One of these edifices—a sepulchral chapel—presents a ve pretty appearance, having a semicircular dome and arched windo with a bevelled basement of black lava, while the dome is of red la The crumbling ruins of an old castle are likewise to be seen on t adjacent heights.

The only doubts which I can see might be opposed to the conc sions here arrived at are—May not this crater-fountain derive waters from the Nimrud Tagh itself—a group of conical peaks havi no less than six distinct and lofty pinnacles rising above the vall of the Kara Su?

But the trend of the Nimrud Tagh does not lie towards the vall of the Kara Su, but with the Belishan Tagh towards the valley Akhlat, which contributes several tributaries to Lake Van. The Be shan Tagh sends off tributaries to the upper Murad Su and to the K Su, whilst the mountain tarns of Nasik and of Kamp belong, the fi to Lake Van and the second to the upper Murad Su. A glance Captain Maunsell's map, although it ignores the Tacht Ali, Nur-s and its fountain, and the Kurd village of Kotni, sufficiently indica the independence of the Kara Su from the easterly mountain grou although deriving tributary waters from the Antogh Tagh, or weste groups.

Such are the relative positions of Lake Van and the valley of t

Kara Su, that it might well be conceived that before the waters of the lake were dammed up by the overflow of lava, of which the Tacht Ali constitutes the culminating point, the natural course of these rivers of Van would have been by the valley of the Kara Su; and what can be more probable than that, after the epoch of the overflow, or at the very time of that overflow, they were able to maintain their old course, only by a subterranean channel?

Another objection might be suggested inasmuch as the amount of water, although very considerable, scarcely equals what might be expected from the outpour of so vast a lake as that of Van. But to this latter objection it may be opposed that no outlet save this is at present known.

It is, however, by no means certain that some of the tributaries to the river Tigris, so carefully delineated in Captain Maunsell's map as having their origin close to the southerly and outer crust or lip of the basin of Lake Van, may not be derived from the percolation of the waters of the lake through the said outer crust, just as is opined of the Nūr-shīn crater-fountain in an opposite direction.

This, however, remains a question for further minute topographical investigation, and, should such be the case, Lake Van would have (and examples of such are well known) outlets for its surplus waters, to the Euphrates on the one side, and to the Tigris on the other.

THE GEOGRAPHY OF PERSIA.*

By SIR FREDERIC J. GOLDSMID, K.C.S.I., C.B.

By direction of the French Minister of Public Instruction and Fine Arts, M. J. de Morgan left Paris for Tehran in September, 1889, on a scientific mission, the nature of which will be understood from the classification of its results under the four heads of (1) Geographical, (2) Linguistic and Ethnographical, (3) Archæological, (4) Geological and Palæontological. Accompanied by his wife and an old soldier-servant, he reached the Shah's capital by the well-known route of Baku, Resht, and Kazvin. There, by aid of the French Legation, he was enabled to organize his camp and make all necessary arrangements for the contemplated exploration; and, late in November, he broke ground in the direction of the Lár valley. The mission, after a halt of some days at Rehna, near the foot of Demavend, found its way to Amol, a town of varied fortunes, and thence into the lower plains of Mazanderan, amid marshes and streams. From Amol its course was an easterly one, and, visiting Barfarush, Sari, and Ashraf, it arrived at Asterabad, where it met with a kind reception from the governor and other residents. After a month's exploration in these parts, it returned westward along the shores of the Caspian—on the right of the Shah Abbas causeway—to Gilan, having taken occasion to visit Ferahabad, the favourite residence of the great Abbas, Mashhad-i-Sar, Aliabad, and the district of Tunekabun, of which the "Khorremabad" of Mr. Curzon's map is an interesting village. Crossing the Kizil Uzun in a boat, the explorers arrived for the second time at Resht, and then proceeded from that place into the Russian Talish, by Astara and Lenkoran. Two months were passed in exploring the mountainous country inland of these roadsteads, one of the main objects of research being the local burial grounds, an inspection of the several examples of which resulted in the discovery of no fewer than 220 tombs. But the action of the Russian Government put a stop to this process of archæological investigation; and, the return of the mission to Lenkoran, and interchange of telegrams with the French Embassy at St. Petersburg having failed to effect a renewal of operations, a move was decided upon to the Little Caucasus. Early in July, then, the small party of explorers, passing up the whole length of Lenkoran, entered the plain of Moghan at Balasui-var, and reached the Araxes at Karadui. Thence crossing the river, they moved among the mountains to Shusha, from which point they turned south to Tabriz, recrossing the Araxes by the Khudafrin bridge, and following the road through the Karadagh, west of Ahar.

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* 'Mission Scientifique en Perse,' par J. de Morgan. Tome premier. Etudes Géographiques. Paris: E. Leroux, 1894.

For the "Geography" of the book under notice, the journey above sketched out may be held to include the main work of M. de Morgan's *Mission scientifique*, because the shores of the Caspian and contiguous provinces occupy the lion's share of the ground he has described. With respect to the time taken up in accomplishing the objects proposed, it certainly represents the larger half, though we may roughly estimate a full year in 1889–90 for the one, and a full year in 1890–91 for the other division. In making a fresh start from Tabriz, a valuable addition to the staff of the mission was found in the person of Colonel Abdi Tataos Khan, a young artillery officer of eight and twenty, who spoke equally well English, French, Turkish, Persian, and Armenian. The grant of his services was but one of many acts of courtesy, on the part of the higher authorities, which M. de Morgan experienced in Azerbaijan, and which he now gratefully acknowledges. "Reçus de la façon la plus gracieuse par S. A. I. le prince Héritier, S. A. l'Emir Nizam, alors Gouverneur-Général de l'Azerbeidjan, par S. E. Nousseret-ed-Dôlet, actuellement Gouverneur à Tauris," are his words, and again, "nous avons passé à Tauris quelques jours charmants." It need scarcely be added that the French minister at Tehran and his coadjutor the French consul-general at Tabrîz had something to do with bringing about this partly moral but wholly substantial support.

The party now proceeded in a southerly direction by Maragha, and, east of the Urmiya, or Urmi lake, to Miandoab, where the Kurdish population is said to begin. Though well treated at Suj Bulak and in the Mukri * district, where a comparatively civilized chief named Saifu'd-din exercised rule, the rougher side of the Kurdish character was manifested towards them further on, at Sakiz and Bana. These two districts, which form part of the province of Sehna, contain a population of whom many are hostile to strangers. M. de Morgan, in active search of Assyrian inscriptions, the existence of which had been indicated by Sir H. Rawlinson, penetrated the valley of Kelvi (or Lesser Zab) to Sardasht, a mountain village; but the difficulties foreshadowed in an attempt to carry on his work satisfactorily among Turkish Kurds caused him eventually to modify his original intention of attaining the right bank of the Tigris at Mosul, and to prefer passing south into Luristan, thus remaining under the ægis of Franco-Persian protection. Retracing his steps to Mukri, he took advantage of the hospitality of Saifu'd-din to locate Madame de Morgan in that chief's stronghold at Sardárabad, and himself posted back to Tabriz, there to mature and discuss his modified plans in the society of influential advisers. Having rejoined his lady on the completion of his arrangements, M. de Morgan left Sardarabad on November 20. Space would fail us to follow the mission, step by step, through the remainder of its progress. Suffice it to say, it had many troubles to encounter, at one time owing to severe snowstorms which occasioned serious loss of life, and general inclemency of the climate; at another, from the rough treatment of the natives, as at Hamadan and Asadabad. Among the places visited may be named Burujird, Ushtara Kuh; the post-road stations between Hamadan and Baghdad; Shuster, Dizful, Ahwaz, Mohammerah, Bushire. On December 1, 1891, the mission had returned to Paris.

Judging from the section of "Geography," the whole work should form a notable addition to the bibliography of Persia. Its letterpress and illustrations are worthy of Leroux, though a few of the photographs are somewhat uneven in execution. The volume now before us includes a preface and ten main divisions; one of these, "Les Rives Méridionales de la Mer Caspienne, entre l'Atrek et l'Araxe," is subdivided under six minor heads. There is also attached a very useful "Répertoire des Noms Géographiques," which gives the names of places both in the Persian and Roman character.

In conclusion, we would add that the greater the number of ministers of instruction and the fine arts that can be found, throughout the civilized world, ready to despatch scientific missions into lands possessing material for intelligent exploration, the better for the army of readers who profit from their results. The three new maps, the production of which is due to M. de Morgan's labours, are those of—

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* Curzon and Thielmann call it Mikri.

1. The Southern Shores of the Caspian, including Asterabad, Mazanderân, Gilan, and the Talish.
2. Mukri Kurdistan.
3. Elam.

MR. CLEMENT LEY'S WORK ON CLOUDS.*

By H. N. DICKSON, F.R.S.E.

At a time when the burning question amongst meteorologists is that of cloud classification and cloud nomenclature, it is specially satisfactory to have a complete summing up and judgment from one who has devoted the greater part of his life to a study of this subject, and who has long enjoyed a European reputation as a skilled observer of clouds. Innumerable as have been the improvements and modifications proposed from time to time on Howard's original nomenclature, these have hitherto consisted almost entirely of subdivisions of Howard's three great classes—the cirrus, the stratus, and the cumulus; and the divisions into intermediate forms have been for the most part quite arbitrary, limited in number by the observer's supposed powers of discrimination. Mr. Ley takes advantage of our increased knowledge of the mechanism of atmospheric currents, and his book is an attempt to classify the results of his lifelong observation according to the different conditions which we now know give rise to the formation of clouds. Utilizing Helmholtz's deductions as to the wave surface of a current of air produced by another current of air flowing over it, Mr. Ley includes all the stratiform clouds under the term "Clouds of Interfret." Cumuliform clouds come under the heading "Clouds of Inversion," their formation being ascribed to condensation in ascending currents; and the luminous and cirriform clouds, formed of falling particles which tend to "lag" as they enter lower and more slowly moving strata, are termed "Clouds of Inclination." Under these three types are included all the observed forms, except ground-fogs and haze, which are called "clouds of radiation," and the greater part of the book is devoted to a description of the species occurring under each head as a consequence of special conditions modifying the processes of interfret, inversion, or inclination. Seventeen species are considered sufficient to cover the most frequent cases, and the classification is completed by nine more specialized forms. Although the number of different kinds is considerable, the method at once commends itself as enabling the observer to connect each cloud-picture with distinct physical processes going on in the atmosphere.

In the latter part of the work the author discusses the general circulation of the atmosphere as deduced by Ferrel from theoretical considerations, and compares the prevailing cloud-forms observed in different parts of the globe with those which would be produced, according to Mr. Ley's views, if Ferrel's circulation be correct. A chapter on the clouds of cyclones and anticyclones is practically a restatement of the author's celebrated investigations on the currents in these systems, but we note that Mr. Ley accepts the hypothesis that the ascending currents in cyclones originate through local heating at the Earth's surface, no explanation being given of Hann's conclusions as to the occurrence of cyclones where such conditions do not exist.

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* 'Cloudland: A Study on the Structure and Characters of Clouds.' By the Rev. W. Clement Lay. London: E. Stanford, 1894.

THE SOUTHERN URALS:* RESULTS OF RECENT JOURNEYS.

By Dr. FUTTERER.

The opening of the new railway will mark the first stage of development of a district which, thanks to its extensive forests, abundant minerals, and unlimited water supply, bids fair to become one of the most important of the Russian Empire in Asia. Engineers and forestry experts from Western Europe, brought in contact with the work of the foundries and smelting-works, have elicited the apparently paradoxical fact that the population of many of the mining and smelting districts in the Urals stands on a higher level of civilization than is found in regions west of the Volga. The central and southern Urals are easily accessible. The large saloon steamers on the Volga cover the distance from Nishni Novgorod to Samara in a little over forty hours; and Samara is the starting-point of the Siberian Railway. From Samara the central Urals are reached by steamer on the Kama river to Perm, and thence by rail to Tjumen. The two trans-Ural railways are to be united by a north and south line. From Samara the Siberian Railway runs *viâ* Ufa, Slatoust, and Miess to Chelyabinsk; and in September last the extension to Omsk was completed. To the east of Ufa the line rises gradually over successive plateaus to a great height, and the country only assumes a mountainous character between Slatoust and Miess in the Furesan basin, where the descent into Siberia has already begun. Deep cuttings, high bridges, and long stretches of steep rock-faces, showing marks of blasting, lead with many windings through the mountains, recalling the southern Black Forest Railway. Only tunnels are absent; these have been everywhere avoided, even at the expense of very deep cuttings, to prevent possible interruptions of traffic by their collapsing. The bridges are all of iron. The speed of the trains is not great; the journey from Samara to Chelyabinsk—a distance of 524 miles—occupies thirty-six hours, an average speed of 14½ miles an hour. Stoppages of three to forty minutes are made at every station, and buffets are provided at each. On the Moscow-Samara-Siberia line there are no sleeping or restaurant cars, but in the through trains two beds can be fitted in each compartment, for which the travellers must provide blankets and pillows.

The condition of the roads is an important matter in the industrial districts. Near the great smelting-works at Belarezk much has been done during the last fifteen years, and the main roads for bringing in supplies for the furnaces are extremely good. The road between the works and the railway station at Wasovaia, however, is in a terrible state even in dry weather, chiefly because it passes through properties not owned by the foundries.

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* Abstract of paper read at the Berlin Geographical Society, November 3, 1894.

In the Rundblick district, great numbers of dark parallel ranges of hills can be seen from any of the more outstanding heights, as, for example, Fremel (4900 feet), most of them to the westward, stretching from far to the north towards south-south-west. The outline of these ranges is remarkably regular, broken only here and there by a summit of unusual height. The view to the eastward is very similar. The ranges beyond, not so high as the western mountains, extend north and south as far as the eye can reach, and everywhere the undulating character is maintained; no high peaks or deep valleys disturb the peaceful aspect of the country. None of the western ranges have this uniform character so strongly marked as this so-called main chain of the Urals, and it persists even further to the north, where the same range passes more into the middle of the mountain region, whence its frequent designation of "central chain of the Urals," which is rather misleading here in the south, as the often isolated groups in the Siberian steppes can scarcely be taken as an eastern equivalent to the gigantic peaks of the west, such as Fremel, Sigalga, Maschark, etc. The real significance of the Ural Tau lies in its geological position, which makes it the watershed between Europe and Asia.

On a first glance at the map, it seems surprising that the rivers rise on the low Ural Tau and break through the high western chains, but the geology of the district shows that the former represents the oldest part of a range existing in Palæozoic times, to which the western peaks (Sigalga, Nari, etc.) were added in the Devonian period by faulting. With the mountains in a north and south line the rivers would flow east and west towards the sea, and as new parallel faults formed the river-courses would be blocked until a fresh opening was broken through the newer ranges, and the second channel would remain permanent if the erosive action of the water kept pace with the successive faulting, or if its violent outbreaks always took place at the lowest part of the mountain barrier.

The contrasts which make the landscapes of the Alps remarkable are in the Urals equalized and obliterated into monotony. The valleys are broad depressions without marked gradients, partly covered with forest, and at the lowest level with marsh or marshy woodland. No sparkling brooks unite to form the rivers, the waters take their slow and melancholy way from low-lying bogs. Looking down from a height, one sees vast stretches of forest, between which marshy waters or lakes nearly covered with vegetation reveal the birthplace of great rivers. These places are almost impenetrable; a passage can only be made in the face of great difficulties, and communication really depends on the long hard winters. The forest extends up to the line of 3600 feet, and only the highest parts of the peaks show bare rock and boulders.

The forests of the Urals are of the greatest economical importance. For decades everything depended on the supply of wood in the immediate neighbourhood of the populous districts, but in the last half-generation a change has taken place; many places are reafforested, and signs of cultivation are visible. The smelting-works now receive charcoal for fuel from the most distant regions, thanks to the establishment of widely distributed charcoal heaps and the construction of roads. Where the transport of fuel is not possible during summer, it is accomplished in winter by means of sledges. Since the forests are now no longer destroyed, but only the superfluous wood utilized, the production of fuel will be sufficient to meet a greatly increased consumption as soon as former damage is fully made good. A vigilant watch is kept on the forests to prevent harm being done; for even in the spring great conflagrations are easily caused by the camp fires of the nomad Bashkirs.

Besides fuel, the forests have to furnish material for building the vessels which carry the products of the smelting-works to the Volga, and for this large quantities of the best timber are required. In Belarezk alone some sixty vessels are built annually, of at least twice the size of the ordinary craft for inland navigation in Germany. In spring, when the water is highest, all the vessels set out for the Kama, *viâ* Ufa, and at this season the river is entirely covered with them. After reaching the Volga below Kasan, the greater part of the flotilla goes to Nishni Novgorod. The boats themselves are sold for what they will bring, which is often scarcely the price of firewood. It is thus only possible to take away the manufactured products of the smelting-works once a year, and the production is limited in this way to some extent, for the supply of raw material could support a much greater trade. The evil could be removed by the construction of a line along the east side of the Ural Tau, a work presenting no serious difficulties.

THE MONTHLY RECORD.

THE SOCIETY.

The Sixth International Geographical Congress.—As this number is going to press the arrangements for the London meeting of the Congress are complete, and the ordinary work of the Society is practically suspended to allow of all possible attention being given to the foreign members as they arrive. The office of the Congress was removed from the house of the Royal Geographical Society, where all the preliminary organization has been carried out, on Friday, July 26, and took up the quarters in the Imperial Institute which have been hired for that purpose. Up to July 22, 1265 members' tickets had been issued, and 160 transferable tickets for ladies were also taken. The foreign members reported up to that date numbers close on 400, France, Germany, and the United States being the countries most largely represented. Nearly 200 delegates from foreign governments and geographical societies are included in these numbers. A programme of the meeting and a provisional programme of the papers to be read were issued at the beginning of July; the first List of Members was issued on July 24, followed by a second list on Saturday, July 27. A daily *Journal of the Congress* will be issued every morning at 9 a.m. from July 26 to August 3, the principal part of it being given in English, French, and German. Abstracts of all the papers to be read have been printed and distributed in advance.

The Society's Flag.—A flagstaff has been erected on the south-western angle of the roof of the Society's house, and a special flag designed by the President—a Union Jack with the Society's crest in the centre—was hoisted for the first time on the occasion of the meeting of the Sixth International Geographical Congress.

AFRICA.

The Population of West Central Africa.—In the absence of complete data for the estimation of the population of Central Africa, the figures which have been hitherto given have been necessarily based on broad generalizations from the scanty material available, and accordingly the most diverse results have been obtained. In two different quarters attempts have lately been made, by an examination in detail of the information so far collected, to at least pave the way for a more correct estimate than has hitherto been reached, for certain portions of that continent. Restricting the field of inquiry to the Congo basin, the *Mouvement Géographique* has, during the last few months, published a series of notes, dealing with various separate districts, obtained either from the explorers themselves or from their published writings; while the problem has been attacked by Dr. A. Vierkandt, of Hamburg, in a brochure accompanied by maps. In this, while intended primarily to relate only to the Bantu negroes of West Central Africa, the Sudan negroes have been subsequently included, whereby instructive comparison can be made between ethnographically distinct regions. The methods employed—both quantitative, by which direct estimates of population are formed for individual areas, and qualitative, by which conclusions are drawn from a consideration of the economic or other conditions which prevail—are briefly explained in Dr. Vierkandt's introductory remarks. He insists particularly (1) on the danger of incorrect generalizations, owing to the sudden contrasts always to be found among uncivilized races; (2) on the necessity of distinguishing the typical from the exceptional; and (3) on the liability, due to various causes, to an over-estimate of density. The results obtained from a detailed examination of the various subdivisions of the whole area, lie rather in the direction of a determination of types of settlement and relative densities, than of a direct estimate of the total population. (A supplement dealing tentatively with the latter shows results considerably lower than those of Supan.) In the Bantu region a certain regularity of distribution is to be noticed, a generally well-peopled coast zone being followed by a sparsely inhabited tract, and this again by a dense population in the far interior, while a similar symmetry is to be seen both north and south of the thinly peopled forest region. One of the most noteworthy phenomena is the tendency (closely connected with the migrations of tribes) to concentration in border-lands, whether along the coast and the courses of rivers, or along the margin of the forest. The chief factors of distribution may be divided into physical, ethnographical, and historical, examples of which are respectively, the distinction between the forest and savannah, the differences between the Sudan and Bantu negroes in point of culture, and the effects of the slave trade and of contact with European influence. As regards the types of settlement, a contrast may be drawn between those with a relatively dense, industrial population, and a more sparse one whose mode of life is determined by considerations of defence. The result of Dr. Vierkandt's study is to show that in the Bantu region dense populations are found only in restricted areas, while "dense" must always be taken as a relative term. This should be borne in mind in reading the numerous accounts of dense populations published by the *Mouvement*, which can at best, in the present state of our knowledge, cover a portion only of the whole area, and that perhaps the most thickly populated.

Expeditions in the Niger Basin.—Of the three expeditions—English, French, and German—which within the past half-year have sought to secure a footing for their respective nations in the *Hinterland* between the Volta and the Niger, an account of the first was given by Captain Lugard at the concluding meeting of the Royal Geographical Society, while in the last number of *Petermann's Mitteilungen* (1895, p. 151) an interesting letter from Lieut. von Carnap is published, giving an account of the German expedition, which, starting from the Togo-land Protectorate under the leadership of Dr. Gruner, has performed some important geographical work apart from its political objects. Proceeding by way of Salaga and Yendi, and experiencing much difficulty in the country of Mango from want of water, the expedition traversed the kingdom of Gurma, about which

Barth collected some information in 1853, but the capital of which had never been previously visited by a European. The French expedition arrived only six days later than the German advance party under Lieut. von Carnap. After a long detention here, during which an agreement was concluded with the king, the expedition proceeded to Say, on the Niger, which is described as the hottest place visited (107° Fahr. and over in February) and a particularly undesirable residence, owing to the millions of insect pests and the pestilential atmosphere arising from the lagoons. Hence the course of the Niger was followed southwards by a part of the expedition, while as far as Girri the country on its bank was surveyed by Lieut. von Carnap. Thus the section of the river between Say and Gomba, which has for so long remained as a dotted line on our maps, has at last been explored. On the way the porters were attacked by small-pox, and it was decided in the end that Lieut. von Carnap should return with the sick by way of the river and Lagos, while Dr. Gruner and Dr. Döring, another member of the expedition, returned through Borgu. Besides a route survey and determinations of positions by the theodolite, birds and insects were collected, while ethnographical observations were made as far as possible by Lieut. von Carnap. Of the French expeditions, two of which started from Dahomey, that under Captain Decœur visited Nikki (reached by Captain Lugard), while the other under Captain Toutée (*Comptes Rendus*, Paris Geogr. Soc., 1895, p. 179) reached the Niger at Bajiebo (Gladjebo on Perthes' map, Bajibo of Lugard) in the short space of forty-nine days after leaving Kotonu. He is said to have explored the basin of the Murza and carried out a survey of the route. He throws great doubt on the supposed journey of Duncan in 1845, though it will be remembered that the fact at least of that journey seemed to be established by Dr. Wolf's explorations in 1889.

M. Clozel's Explorations between the Congo and the Shari.—This explorer, who has lately returned to Paris from an expedition up the Sangha river, which set out early last year, has explored some new ground on the watershed between the Congo and the Shari basins. The *Mouvement Géographique* (1895 No. 14) gives some details as to his route, which led from the Upper Sangha, through the unexplored tract lying between the routes of Mizon and Maistre (both traversed in 1892). After crossing the Mambere, one of the upper branches of the Sangha, on which he had founded the station of Tendira in about 5° N., M. Clozel first reached the village of Budul, chief of the important Bubara tribe, and eleven days later reached the water-parting at an altitude of about 2300 feet. North of this he came upon an important stream named Wom, which he considered to be the upper course of the Logone. After following its course for about 20 miles, the expedition retraced its steps, returning to Tendira, and thence to France.

M. Foureau in the Sahara.—This energetic explorer is still persevering in his attempt to open up a route to the south by way of Aïr. In a letter addressed to the Paris Geographical Society from Biskra on April 14 last, he announced that he purposed on the morrow to set out once more for the country of the Azjer Tuareg, and that he had good hopes of at last succeeding in his attempt. In January, 1894, he prevailed on the Azjer to agree, that on the payment by the Algerian authorities of the value of certain camels which they had lost at the hands of a raiding-party from French territory, they would escort him as far as Aïr on his journey south. He ascribes the failure of his attempt last winter to the fact that he was entrusted with a part only of the sum stipulated, the payment of the remainder being deferred until representatives of the tribe should proceed to Tuggurt to receive it. The whole sum having since been paid to these, M. Foureau is confident that the opposition of the Azjer will at once cease.

AMERICA.

The Future Capital of Brazil.—A recent number of the *Comptes Rendus* [illegible] the French Academy states that, the National Government of Brazil having decid[illegible] to transfer the capital to a more favourable situation, a committee under M. Crul [illegible] the director of the Rio observatory, was nominated for the purpose, and has now co[illegible]pleted its work. A spot, very advantageously situated on the high plateau, has bee[illegible] chosen in the region of the Pyreneans, between the latitudes of 15° 40′ and 16° 8[illegible] and between 49° 30′ and 51° W. long. Owing to the great altitude of this spo[illegible] which is over 3500 feet above the sea, one can expect a pleasant temperatur[illegible] similar to that of Southern France during the summer, while fever, so commo[illegible] in the coast region of Brazil, is not likely to be prevalent. The numerous rive[illegible] which flow in the neighbourhood are capable of supplying a population of [illegible] many as a million inhabitants with plenty of water. The only drawback is th[illegible] distance from the coast, as it will take from eighteen to twenty-four hours of rai[illegible] way travelling to reach the capital, after a railway has been constructed from th[illegible] coast. A quadrilateral space 100 miles long and 60 miles wide has been assigne[illegible] for the future capital.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Earthquakes in Russia.*—This is an important contribution to the liter[illegible]ture of earthquakes, which will take its place by the side of the catalogues [illegible] R. Mallet and A. Perry. A. Orloff, the author of several works on earthquak[illegible] published in Russia, began the compilation of this catalogue in 1869, and he h[illegible] nearly terminated it when death put an end to his life-work in 1889. Profess[illegible] Mushketoff has not only completed the work by compiling the lists for t[illegible] years 1880–1887, but he has also revised the whole, and added to it a m[illegible] of the Russian empire and the adjacent territories of Asia, which shows at [illegible] glance the geographical distribution of earthquakes, as also several diagra[illegible]s showing the distribution of earthquakes during different months of the ye[illegible]r. In an able preface, he has also summed up the conclusions which may be dra[illegible]n from the catalogues, and given a translation of two chapters from Profes[illegible]or Milne's well-known book relative to the effects of earthquakes upon buildings. A special value has been given to the work by including in it China and the vas[illegible]al territories of the Chinese empire, which are so little represented in the catalog[illegible]es of R. Mallet and A. Perry. Ferck's list for China, as also M. Peschuroff's list of earthquakes in China during the years 1371 to 1644 (compiled by the Russ[illegible]an author from the ‘History of the Min Dynasty’), and Professor Vasilieff's data [illegible]or Manchuria, have been embodied in the new catalogue, as well as many m[illegible]st valuable data relative to Turkestan, Dzungaria, Mongolia, and parts of Asia Mi[illegible] and Persia situated on the frontier of Caucasia. All these are quite new to W[illegible] European literature. For European Russia, Caucasus, and Siberia all avail[illegible] materials have been utilized, the local annals, especially those of Eastern Sibe[illegible] having proved to be of a very great value. The catalogue contains a list of ab[illegible] 2400 separate earthquakes which occurred in 560 different localities, from 596 [illegible] till 1887. Out of them, 710 took place in China, 549 in East Siberia, 36 in W[illegible] Siberia, 202 in Central Asia, 590 in Caucasia, 121 in Asia Minor and North Per[illegible] and 188 in European Russia. If those periods only are taken into considerat[illegible] during which the observations went on without interruption, the frequency of earthquakes may be represented as having been 640 in each hundred years in Caucasia, 310 in China, 290 in East Siberia and Turkestan, 138 in Middle and South Russia, and 18 only in North Russia, Finland, and the Baltic provinces. As to their frequency during the different seasons of the year, the data of the catalogue show that, while in Siberia and Central Asia earthquakes are more frequent during the cold seasons (winter and autumn) than during spring and summer, the proportion is reversed for China and Caucasia, as is seen from the following table:—

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* ‘Catalogue of Earthquakes in the Russian Empire,’ by I. Mushketoff and [illegible] Orloff (being vol. xxvi. of the *Memoires* of the Russian Geographical Society for Gene[illegible] Geography). St. Petersburg, 1893. 580 pages. With a map and several diagra[illegible] (Russian).

NUMBER OF EARTHQUAKES.

	Spring.	Summer.	Autumn.	Winter.
China	181	239	137	123
Siberia	160	123	141	177
Central Asia...	23	44	87	47
Caucasia and adjacent countries	166	188	96	209
Other regions	31	34	57	70
Total	561	628	518	626

The descriptions of separate earthquakes, especially those of the last two centuries, are particularly interesting—the more so as the volcanic eruptions which took place in Kamschatka have been described by competent observers. The earthquakes which took place in our century round Lake Baikal, on the south-west coast of the Caspian Sea, and in the Tian Shan in 1887, are so well described that some of the accounts given are in themselves very valuable monographs.

Early Magnetic Observations.—By one of those curious coincidences of discovery which have so frequently occurred in the history of science, two German investigators have found almost simultaneously the records of the earliest systematic observations of the variation of magnetic constants, and the first isoclinic magnetic map. In 1721 Professor W. Whiston, of Cambridge, published a book entitled 'The Longitude and Latitude found by the Inclinatory or Dipping Needle; wherein the laws of Magnetism are also discovered,' and this seems to have been to a large extent lost sight of, perhaps discredited by Sir Isaac Newton's personal objections to the author. References are indeed found in English memoirs to Whiston's work, and the "discoverers" of his observations in the libraries at Berlin and Göttingen have not perhaps lighted upon such a novel find as they suppose. Dr. Wilhelm Felgentraeger describes Whiston's work in a paper entitled "Die Isoklinenkarte von Whiston und die säkulare Aenderung der magnetischen Inklination im östlichen England," for a copy of which we are indebted to Professor Hermann Wagner. It reproduces the map of lines of equal dip drawn up for England by Whiston in 1721, and gives a diagram showing graphically the changes in the position of lines of equal dip at different times. Simultaneously, Mr. L. A. Bauer at Berlin had his attention drawn to the book, and published an account of it in the *Bulletin* of the Philosophical Society at Washington. He also gives a general account of Whiston's observations, with comments on Dr. Felgentraeger's paper, in *Nature* for January 24, and notes further observations with the dipping-needle at sea contained in a subsequent book by Whiston published in 1724.

Formation of Lake Basins by Wind.—Professor G. K. Gilbert records some interesting observations made in the drainage area of the Arkansas river in the *Journal of Geology* for January-February, 1895. He shows that a class of shallow lakes exists distinct from those formed in hollows of the drift or enclosed by sand-dunes. The main feature of these lakes is that they are extremely shallow; indeed, they can be waded across in every direction. They have no definite outlet or inlet, receiving water from rain, and having different degrees of permanence. The normal slopes of the land are always sharply interrupted by the steep sides of their saucer-like depressions. Most of these lakes which have been examined are formed in shale, on which little vegetation is found, and the writer was driven to the conclusion that they were excavated by the force of the wind scouring out the disintegrated rock unprotected by vegetation, the rate of wind-erosion being no faster than the disintegration of the surface layers of the rock by weathering. The theory of origin is that when by any accident the plant-covering of an arid region is locally destroyed, the wind sweeps out the disintegrated material, and in favourable conditions a basin is produced. If this is alternately filled with water and dried up, the excavating power of the wind may have frequent opportunities of continuing to deepen the hollow. Professor Chamberlin also suggests that the shallow lakes of arid regions may be substantially deepened by cattle and other animals wading in to drink, and carrying away a quantity of mud on their legs, which is lost in the surrounding country before they return to the water.

Biological Distribution and Temperature.—Dr. C. Hart Merriam publishes in the *National Geographic Magazine* for December 29, 1894, a paper which summarizes his researches during the last twenty years on the law of the geo-geographical distribution of terrestrial animals and plants. It is a memoir of high importance in physical geography, enunciating as it does the definite terms of the control exerted by the predominant feature of environment upon living creatures. The plant and animal zones of North America are alone considered in this paper. There are three main zones of life—the *Boreal*, divided into Arctic, Hudsonian, and Canadian; the *Austral*, including the Transition, Upper Austral, and Lower Austral; and the *Tropical*. The problem which Dr. Merriam set himself to solve was to find the causes which prevented the vegetation of each zone from spreading over the neighbouring divisions. He touches lightly on his labour in testing several theories of possible climatic control, all of which were in turn found insufficient, but he arrives finally at two fundamental propositions which he finds sufficient to explain the facts. These are (1) the northward distribution of animals and plants is determined by the total quantity of heat—the sum of the effective temperatures; (2) the southward distribution of Boreal, Transition-zone, and Upper Austral species is determined by the mean temperature of the hottest part of the year. The sum of the effective heat is the constant obtained by adding together the excess of the daily temperature above 43° Fahr., which is the minimum generally accepted as that a which active plant life begins. The effective temperature begins in spring, when the daily temperature first rises above 43°, and continues to accumulate until in autumn the daily mean becomes once more lower than 43°. The paper is illustrated by a series of vegetation-zone and temperature maps of the United States. The influence of humidity was found to be of secondary importance to that of temperature in limiting the zones.

High Balloon Ascent.—The geography of the air, which, together with oceanography, claims a place beside the science of the Earth's land surface as forming part of geography, has been notably advanced by Dr. Berson, of Stassfurt, who has made successful observations at a height of 31,300 feet above the surface. The highest balloon ascent previously made was by Coxwell and Glaisher in 1862, when they succeeded in making observations up to 29,000 feet, although Mr. Glaisher believes that the balloon rose to 37,000 feet while he was unconscious. Dr. Berson, we learn from the *Tour du Monde* of March 2, has made a number of ascents in his balloon, the *Phœnix*, attaining heights of 20,000 feet, or nearly so, on four occasions. He found that at all seasons of the year the temperature at these high altitudes is practically constant, varying from −14° to −19° Fahr. On December 4, 1894, Dr. Berson started on his ascent at 10.28 a.m. alone in the car, and at noon, when the elevation of 22,000 feet was reached, he began to feel discomfort from reduced pressure; but he had provided for this contingency by taking up with him a large steel cylinder of compressed oxygen fitted with a tube for breathing through, and thus he was able to rise without serious discomfort until the altitude of 31,300 feet, which was reached at 12.49. The sky was clear and of a pale blue; the temperature had fallen to −54° Fahr. Descending slowly, he reached the ground safely in three hours. His experience seems to show that with suitable precautions higher ascents may safely be made, and the use of compressed oxygen in mountaineering above 20,000 feet suggests itself as a possible aid to alpinists.

CORRESPONDENCE.

Sijilmásiyah and Tafilet.

Mr. Walter B. Harris, in his paper "A Journey to Tafilet," in the current number of the *Geographical Journal*, gives some very interesting particulars respecting ancient Sijilmásiyah (which he writes "Sijilmassa") and its ruins, which he visited; and he supposes that that must have been the former name by which Tafilet was known. He says (p. 334): "It is in the district of Wad Ifli that the ruins of the city of Sijilmassa are situated. . . . The place must at one time have been a very large city, though but little remains now but crumbling ruins, with a mosque and minaret in tolerable repair, and a half-ruined bridge over the Wad Ziz. . . . Although the name Sijilmassa is used, the common term for the ruins is Médinat el-Aamra. . . . The date of the founding of Sijilmassa is difficult to gather, for, probably long before the town was built, there was a Berbér colony there; but the period of its destruction is better known," etc.

I have quite recently met with much information respecting this very ancient place—the name of which, as I have written it, is, in the original Arabic سِجِلْماسية—in writing an account of the rise of the Ubaidian, or Isma'ilian, or Fatimite dynasty of Misriyah, or Egypt, which first rose to power there, and from which dynasty the present Agha Khan of Bombay, the head of the sect of "Khojas," as they are "popularly" designated, claims to be a lineal descendant.

Sijilmásiyah is mentioned in the Arabic work entitled the 'Masalik wa Mamalik,' and in the 'Geography' of Ibn Haukal, and lies about 200 miles a little to the east of south from فاس, Fás (which Europeans, who take such strange liberties with foreign names, call *Fez*). These works state that from Kairwan to Sijilmásiyah is, by way of the desert, a journey of nearly fifty *marhalah* or days' journey, and that from Tahut to Sijilmásiyah is fifteen *marhalah*. When these works were written, Fás (Fez) had not yet fallen into the hands of the Isma'ilian, and Al-Káhirah (vul. "Cairo") had not yet been founded.

The events of the rise of this dynasty and sect show that Sijilmásiyah is a very ancient place, and is said to have been founded by the Romans. It is stated, according to several Oriental authorities, that Ubaid-ullah, Abu 'Ali, son of Muhammad, son of Abd-ullah, son of Abu-l-Kasim, son of Muhammad, son of Isma'il (after whom the dynasty took its name), eldest son of the Imam, Ja'far-us-Sadik, and who was held, by his followers and supporters, to be the only legal and rightful successor to the Imam-ship, and which the sect still hold, rose to power here; that he was referred to by Muhammad in the Kur'an; and it is from a descendant of his that the promised "Mahdi" and "Imam," the Director and Guide—a pretender or two to which offices we have had lately—is to spring.

This Ubaid-ullah-al-Mahdi, the first of them who attained unto sovereign power, was born in 266 H. (879–80 A.D.), but some say in 259 H. (872 A.D.). On Sunday, the 7th of Zi-Hijjah, 296 H. (September, 909 A.D.), with the aid and support of Abd-ullah, the Sufi, he broke out at Sijilmásiyah against the governor of that territory on the part of the Abbasi Khalifahs of Baghdad, overcame him, and brought the territories of Afrikah and Kairwan under his sway; and on Friday, 8th of Rabi'-ul-Awwal, 297 H. (November, 910 A.D.), he was saluted as Khalifah.

Another account of his rise is, that when Ubaid-ullah-al-Mahdi reached Sijilmásiyah, the news thereof was brought to Malik Shai'a, the last of the Maliks of the Bani Badr, and Ubaid-ullah was seized by some of the people and brought before him. They said, "This is the person to acknowledge allegiance to whom Abu 'Abd-ullah-al-Shaba'i has been exhorting the people of Afrikah." On this, that Malik had Ubaid-ullah-al-Mahdi put in durance. Abd-ullah-al-Shaba'i, his advocate, hearing of this, assembled a great number of people together in order to free him by force, and moved to Sijilmásiyah accordingly. Malik Shai'a, hearing of their intention, put Ubaid-ullah-al-Mahdi to death in prison, left his body there, and fled the city. When Abu 'Abd-ullah and his followers reached it, Abu 'Abd-ullah proceeded to the prison, and found Ubaid-ullah-al-Mahdi dead. Some of the latter's companions were present there, and Abu 'Abd-ullah, out of fear lest his design should fail, brought one of them forward, and said to his followers, "This is the Mahdi;" for if he had not done so, and his adherents who had been gathered together to free him had found that the Mahdi had been killed, his scheme would have collapsed. The public prayers were accordingly read for him from the pulpits of Sijilmásiyah, Kairwan, and Rakakah on Friday, the 21st of Rabi'-ul-Akhir, 296 H. (December, 909 A.D.).

Ubaid-ullah-al-Mahdi is said to have brought Andalus (Andalusia) and most of the territories of the Maghrib under his sway, and that subsequently his *Khadim*, or domestic, the Ka'id, Johar, "subdued all the tracts as far west as the sea, Ukyanus (Oceanus), and the Paradise Islands, which are the extremity of the inhabited world, and from which philosophers commence the division or computation of the different climes."

It was this same Ubaid-ullah-al-Mahdi who, in Zi-Ka'dah, 303 H. (June, 916 A.D.), began to build a strong fortress and sanctuary in the neighbourhood of Kairwan—a distance of two days' journey—on the coast of the Mediterranean, and completed it in Shawwal, 308 H. (March, 921 A.D.), and there he died and was buried, on the 15th of Rabi'-ul-Awwal, 322 H. (March, 934 A.D.). His son, Al-Ka'im Bi-Amar-ullah, Abu-l-Kasim, Ahmad, who succeeded him, named the place Mahdiyah, after his father, the substantial ruins of which still remain. It was Ubaid-ullah-al-Mahdi's grandson, Al-Mu'azz Li-Din-ullah, Abu Tammim, Sa'd, who founded the city Al-Kahirah, or Misr-i-Jaddid (which Europeans vitiate into "Cairo"), and he was the first Isma'ilian Khalifah of the land of Misriyah, or Egypt.

From what I have before stated, it appears that Sijilmásiyah was a well-known city, and the seat of government of those parts from ancient times, and had been founded many centuries, probably, before Al-Mahdi's rise. It was known even then—and is still known, from what Mr. Harris says—as the "Madinat-ul-'Amirah" (not "Aamra," however, as he writes: the word is فاس), signifying "the royal or imperial city."

Sijilmásiyah was known to the old writers and travellers. Marmol states that *Sejelmesse* is the name of a province as well as of a town or city. "The province is about 40 leagues long, and is inhabited by *Barbars* (vul. 'Berbers'). The town seems to have been built by a Roman captain that conquered all *Numidia* as far as *Messa*, and for that reason was christened, '*Sigillium Messa*,' i.e. 'The seat of his Conquest.' . . . It lies south of the *Atlas* range of mountains; and the *wādī* Ziz or river *Ziz*, which is a great river, and springs from the same mountains, passes from thence to the neighbourhood of *Garciluyn*, in the kingdom of *Fas* (Fez), traverses the territories of *Quenena*, *Matagara*, *Reteb*, and *Segelmesse*, after which it enters the *sahara*, or desert."

John Leo says, "The town of *Segelmesse* stood upon a plain near the river *Ziz*, and was surrounded with stately high walls. It had good buildings, magnificent temples and colleges, and a great many conduits for the river water. The air of the place is very moist in winter, but otherwise it is temperate and wholesome enough. *Tafilat*, famous for its dates, lies on the south-west side of this province."

From what I have mentioned above respecting Ubaid-ullah-al-Mahdi, it will be understood why Sijilmásiyah is still a place so venerated, and why on the two great *'ids* or feasts of the Musalman year, such concourses of people assemble there to say their prayers at the *Musalla*, near the mosque. The word (not "msala") means "a place of prayer," and also "a carpet to pray on."

Should Mr. Harris visit that part again, he might chance to find inscriptions among the ruins.

H. G. Raverty, Major.

March 30, 1895.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1894-1895.

Fourteenth Ordinary Meeting, June 24, 1895.—W. T. Blanford, Esq., ll.d., f.r.s., etc., Vice-President, in the chair.

Elections.—*Admiral Henry Boys; Right Rev. Bishop George W. Hamilton Knight Bruce (late Bishop of Mashonaland); Lieut. George S. Q. Carr, R.N., C.M.G.; Walter D. Cronin; Arthur Fisher; Malcolm A. C. Fraser; William Oswald Gilchrist; Franklin R. Kendall; Henry Kitching; Dr. Percy George McReddie; Major Alexander McD. Moore (Royal Irish Fusiliers); Thomas Pink; Major Hugh Montgomerie Sinclair, R.E.; Edward Stapleton; Dr. W. Stirling.*

The Paper read was:—

"The Sierra Madre of Mexico." By O. H. Howarth.

Special Meeting, July 1, 1895.—Sir G. D. Taubman Goldie, k.c.m.g., Vice-President, in the Chair.

Elections.—*Rev. Jacob Benjamin Anaman; S. L. Hinde; J. T. S. Jones; Thomas Henry Willis; Samuel Zivemer.*

The Paper read was:—

"A Recent Expedition to Borgu, on the Niger." By Captain F. D. Lugard, D.S.O., C.B.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them employed to indicate the source of articles from other publications. Geograph names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. R. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of book the list below is denoted by the length and breadth of the cover in inches to nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Alps—Eastern. **Baedek**

The Eastern Alps, including the Bavarian Highlands, Tyrol, Salzburg, Upper and Lower Austria, Styria, Carinthia, and Carniola. Handbook for Travellers. By Karl Baedeker. Eighth Edition. Leipsic: Karl Baedeker, 1895. Size 6½ × 4½, pp. xxiv. and 518. *Maps, Plans, and Panoramas. Price* 10 *marks. Presented by the Editor.*

Austria—Transylvania. **Teutsch and Schul**

Die Art der Ansiedelung der Siebenbürger Sachsen. Von Dr. Friedrich Teutsch. Volksstatistik der Siebenbürger Sachsen. Von Professor Fr. Schuller.—Forschungen zur deutschen Landes- und Volkskunde . . . . herausgegeben von Dr. A. Kirchhoff. Neunter Band. Heft 1. Stuttgart: J. Engelhorn, 1895. Size 9½ × 6½, pp. 56. *Map.*

The writer of the first article traces the mode of settlement in Transylvania by t Saxon immigrants in the twelfth century (Franks of the Rhine). Divided originally i three great groups, the number became greatly increased, while within the groups t settlement was effected by villages. The mutual relations of the settlers are a traced, as well as that in which they stood to the king. The second paper shows t there is a steady though slow rate of increase of the German element in the coun districts at the present day, although in many of the towns a decrease has been broug about by emigration.

Belgium—Colonization. *B.S.R.G. Anvers* 19 (1895): 436–450. **Wauwerma**

Résumé historique des tentatives coloniales de la Belgique. Par M. le Lieutenant-Général Wauwermans.

Bosnia and Herzegovina—Botany. **Murbe**

Beiträge zur Kenntniss der Flora von Südbosnien und der Hercegovina. Akademische Abhandlung. . . . Von Svante Murbeck. Lund, 1891. Size 11½ × 9, pp. 182.

Deals with a region hitherto imperfectly explored, from a botanical point of view, but important from the variety of elements represented in the flora.

England—Thames Valley. **Tau**

Goring, Streatley, and the neighbourhood, including Aldworth, Basildon, Goring Heath, Checkendon, Ipsden, Moulsford, Ashampstead, Nobes's Tomb, Hart's Wood, Collin's End, South Stoke, Moulsford Downs, the River Thames from Wallingford to Reading, the Æscesdune Battle-Field, etc. By Henry W. Taunt. Oxford: H. W. Taunt & Co. [1894]. Size 7½ × 5½, pp. 122. *Maps, Plans, and Photographs. Presented by the Author.*

The first of a series, illustrated by excellent reproductions of photographs, which to deal with various sections of the Thames valley.

France—South-Eastern. **Baedeker.**
South-Eastern France from the Loire to the Riviera and the Italian Frontier, including Corsica. Handbook for Travellers. By Karl Baedeker. Second Edition. Leipsic: Karl Baedeker, 1895. Size 6½ × 4½, pp. xxiv. and 294. *Maps, Plans, and Panorama. Price* 5 *marks. Presented by the Editor.*

France—South-Western. **Baedeker.**
South-Western France from the Loire and the Rhone to the Spanish Frontier. Handbook for Travellers. By Karl Baedeker. Second Edition. Leipsic: Karl Baedeker, 1895. Size 6½ × 4½, pp. xxiv. and 291. *Maps and Plans. Price* 5 *marks. Presented by the Editor.*

Germany—Alsace and Lorraine. *B. G. Club Philadelphia* 1 (1895): 125–140. **Balch.**
Some Facts about Alsace and Lorraine. By Thomas Willing Balch. *With Map and Illustrations.*

Germany—Bavaria—Bibliography. **Gruber and Simonsfeld.**
Die in den Jahren 1892 und 1893 zur Landeskunde Bayerns erschienene Literatur. Von Ch. Gruber. Beiträge zur Landeskunde Bayerns. Bibliotheca Geographica Bavarica. Von H. Simonsfeld. Festschrift d. G. Ges. München. Munich: T. Ackermann, 1894. Size 10 × 6½, pp. 181–227.

Germany—Munich—Geology. **Ammon.**
Geologische Uebersichtskarte der Gegend von München. Von Ludwig von Ammon.—Festschrift d. G. Ges. München. Munich: T. Ackermann, 1894. Size 10 × 6½, pp. 239–338. *Map, Plates, etc.*

Germany—Saxony. ———
Kalender und Statistisches Jahrbuch für das Königreich Sachsen nebst Marktverzeichnissen für Sachsen und die Nachbarstaaten auf das Jahr 1895. Dresden: C. Heinrich, 1894. Size 8 × 5½, pp. 92, xii., and 272.

Hungary—Lake Balaton. ———
A. M. Földrajzi társaság Balaton-bizottságának Jelentése, 1892–93, évi müködeséről. Budapest, 1894. Size 9 × 6½, p. 62. *Maps and Plate.*

Papers on Lake Balaton by different authors.

Hungary—Limnology. *Globus* 67 (1895): 287–288. **Sieger.**
Plattenseeforschungen. Von Dr. R. Sieger.

"A short abstract of some of the more special results lately published by the Plattensee Kommission."

Italy—Libraries. ———
Ministero di Agricoltura, Industria e Commercio (Direzione Generale della Statistica). Statistica delle Biblioteche. Parte I. Biblioteche dello stato, delle provincie, dei comuni ed altri enti morali aggiuntevi alcune biblioteche private accessibili agli studiosi, fra le più importanti per numero di volumi o per rarità di collezioni. Volume I. Piemonte, Liguria, Lombardia, Veneto ed Emilia. Rome: Tip. Nazionale, 1893. Size 10½ × 7½, pp. xlviii. and 208.

Ditto. Volume II. Toscana, Marche, Umbria, Roma, Abruzzi e Molise, Campania, Puglie, Basilicata, Calabrie, Sicilia e Sardegna. Rome: Tip. Nazionale, 1894. Size 10½ × 7½, pp. 296.

Contains the statistics of all the chief libraries of Italy, with notes respecting their formation, and the most important manuscripts or other collections possessed by each.

Italy—Lipari Islands. **Ludwig Salvator.**
Die Liparischen Inseln. Viertes Heft: Panaria. Prag: H. Mercy, 1895. Size 16½ × 13, pp. viii. and 30. *Map and Illustrations. Presented by the Archduke Ludwig Salvator.*

This part continues the detailed description of the several islands of the Lipari group, the general description, forming the conclusion of the whole work, having preceded it in date of publication.

Italy—Malaria. *Cosmos* 12 (1894–95): 14–19. **Ra**

Carta della Mortalità per infezione malarica nel Regno d'Italia. Nota del dott. Enrico Raseri. *With Map.*

In districts of limited extent, the mean annual mortality from malarial diseases amounted in 1890–92 to over 8 per thousand.

Norway, Sweden, etc. **Baede**

Norway, Sweden, and Denmark. Handbook for Travellers. By K. Baedeker. Sixth Edition. Leipsic: Karl Baedeker. London: Dulau and Co., 1895. Size 6½ × 4½, pp. lxxx., 410, and 42. *Maps, Plans, and Panoramas. Price 10 marks. Presented by Messrs. Dulau & Co.*

Norway and Sweden—Botany. **Du**

Om Sphagnaceernas Utbredning i Skandinavien. En Växtgeografisk Studie. Akademisk Afhandling . . . af Karl Fr. Dusén. Upsala, 1887. Size 11½ × 9, pp. vi. and 156. *Map.*

ASIA.

Armenia. **Steven**

Armenia. By F. S. Stevenson. [From the *Contemporary Review*, February, 1895.] Size 10 × 6½, pp. [9].

Central Asia—Moghuls. **Elias and B**

The Tarikh-i-Rashidi of Mirza Muhammad Haidar, Dughlát. A History of the Moghuls of Central Asia. An English version edited, with Commentary, Notes, and Map, by N. Elias. The translation by E. Denison Ross. London: Low and Co., 1895. Size 9 × 6, pp. xxiv. and 536. *Presented by the Secretary of State for India.*

This, the first published or complete English translation of the Tarikh-i-Ras will be welcomed by all students of Asiatic history, while the editor's thorough quaintance with the subject ensures the value of his notes and commentary.

Central Asia—Pamirs, &c. **Cumberl**

Sport on the Pamirs and Turkistan Steppes. By Major C. S. Cumberland. Edinburgh and London: W. Blackwood and Sons, 1895. Size 8½ × 6, pp. x. and 278. *Map and Frontispiece. Price 10s. 6d. Presented by the Publishers.*

Major Cumberland's wanderings in search of sport led him in 1889 over the Pa and as far east as Kurla, in Chinese Turkestan. He was accompanied by Cap Bower, the results of whose cartographic work is embodied in the accompanying by Bartholomew.

Central Asia—Tibet. **Sandb**

The Exploration of Tibet. By Graham Sandberg. [Written October, 1893, in *Calcutta Review.*] Size 9 × 5½, pp. 34. *Presented by the Author.*

Central Asia—Tibetan Language. **Sandb**

Handbook of Colloquial Tibetan. A practical guide to the language of Central Tibet. In three parts. By Graham Sandberg. Calcutta: Thacker, Spink and Co., 1894. Size 9 × 6, pp. 372. *Presented by the Author.*

This grammar deals with the general vernacular language of Tibet, as distinct the old classical language, and modern dialectic varieties. The author has drawn only on previously published material, but on his acquaintance with Tibetans Lhasa and other districts.

India—Sikhim. —

The Gazetteer of Sikhim. With an Introduction by H. H. Risley. Edited in the Bengal Government Secretariat. Calcutta: Bengal Secretariat Press, 1894. Size 11½ × 9, pp. xiv., xxii., and 392. *Maps and Plates. Presented by the Secretary of State for India.*

Java. **Snelleman and Nierme**

Kunstvormen op Java. By J. F. Snelleman and J. F. Niermeyer. Overgedrukt uit den Feestbundel van Taal-, Letter-, Geschied-, en Aardrijkskundige Bijdragen ter gelegenheid van zijn Tachtigsten Geboortedag aan Dr. P. J. Veth. Size 15 × 11, pp. 8. *Plates. Presented by the Authors.*

Korea. *Globus* 67 (1895): 261-266. **Kohlhauer.**

Ein Besuch in Port Hamilton und Chemulpo (Korea). Von Korvettenkapitän Kohlhauer. *With Illustrations.*

An account of a visit made in the latter part of 1883.

Manchuria. **Gowan.**

The Chinese Viceroyalty of Manchuria. (From the Russian of Lieut. Z. Matusovski's 'Sketch of the Chinese Empire.') Translated by Lieut.-Colonel W. E. Gowan. [Reprinted from the *Asiatic Quarterly Review* of January and April, 1895.] Size 10 × 6½, pp. 26. *Presented by the Translator.*

AFRICA.

Central Africa—The Congo. *B.S.R.G. Anvers* 19 (1895): 450–478. **Chaltin.**

Le Congo au point de vue physique, politique et économique. Par le capitaine Chaltin.

Central Soudan. *Ann. G.* 4 (1895): 346-368. **Mizon.**

Les Royaumes Foulbé du Soudan Central. Par M. le lieutenant L. Mizon.

Congo State—Stanley Pool. *B.S. d'Études coloniales* 2 (1895): 25-76. **Costermans.**

Le District du Stanley-Pool. Conférence par le Lieutenant Costermans.

Describes the inhabitants of the Stanley Pool district, and their manners and customs.

Egypt—Climate. *B.S. Khéd. G.* 4 *S.* (1895): 301-312. **Abbate.**

La lumière et la chaleur considérés comme agents bienfaisants du climat d'Égypte par S. E. Abbate Pacha.

Egypt—Irrigation. **Whitehouse.**

Irrigation in Egypt. By Cope Whitehouse. Size 10 × 7, pp. 22. *Illustrations. Presented by the Author.*

Egypt—Oases. *B.S. Khéd. G.* 4 *S.* (1895): 267-287. **Blundell.**

Notes sur une excursion à Khargueh, Dakhel, Farafrah et Behariyeh. Par H. W. Blundell. *With Plates.*

Egypt—Oases. *B.S. Khéd. G.* 4 *S.* (1895): 241-265. **Lyons.**

Notes sur la géographie physique des Oasis de Khargueh et de Dakhel. Par H. G. Lyons. *With Map.*

Madagascar. *Ann. G.* 4 (1895): 310–324. **Gautier.**

L'Ouest Malgache. Par M. E.-F. Gautier. *With Map and Sketches.*

North Africa—Sahara. **Vuillot.**

L'Exploration du Sahara. Étude historique et géographique. Par P. Vuillot. Préface du Colonel Prince de Polignac. Ouvrage accompagné de quarante-cinq Cartes-Itinéraires hors texte, douze Plans, et une Carte du Sahara au 1 : 4,000,000. Paris: A. Challamel, 1895. Size 11½ × 7½, pp. xiv. and 342. *Price* 20 *francs.*

A valuable summary of the various explorations of the Sahara from the time of Major Laing to the present day. It will receive special notice in our pages.

North Africa—Tunis. **Fitzner.**

Die Regentschaft Tunis. Streifzüge und Studien von Rudolf Fitzner. Berlin: Allgemeiner Verein für Deutsche Litteratur, 1895. Size 8 × 5½, pp. x. and 360. *Map and Illustrations. Price* 7*s.*

Descriptions and impressions of Tunis and its inhabitants, drawn from a four years' residence in the country, giving a picture of the land after fourteen years of settled government. Some parts had already appeared in the form of magazine articles.

West Africa—Gold Coast. **Anaman.**

The Gold Coast Guide for the year 1895–96. Containing a large amount of information respecting the Gold Coast. By the Rev. Jacob Benjamin Anaman. London: C. H. Kelly, 1894. Size 7½ × 5. pp. 112. *Presented by the Author.*

NORTH AMERICA.

Hudson Bay Territory—Ungava District. **Turner.**

Ethnology of the Ungava District, Hudson Bay Territory. By Lucien M. Turner. (Edited by John Murdock.) Eleventh Annual Report of the Bureau of Ethnology to the Secretary of the Smithsonian Institution, 1889–90. By J. W. Powell. Washington: Government Printing Office, 1894. Size 12 × 8, pp. 159–350. *Illustrations. Presented by the Director of the U.S. Bureau of Ethnology.*

Newfoundland. **Fretwell.**

Newfoundland and the Jingoes. An appeal to England's honor. By John Fretwell. Boston, Mass.: G. H. Ellis, 1895. Size 8 × 5½, pp. 60. *Price* 1*s.*

Newfoundland. **Prowse.**

A History of Newfoundland from the English, Colonial, and Foreign Records. By D. W. Prowse. With a Prefatory Note by Edmund Gosse. London: Macmillan & Co., 1895. Size 10½ × 7, pp. xxiv. and 742. *Map, Portraits, Plates, etc. Price* 21*s. Presented by the Publishers.*

This will be referred to elsewhere.

Niagara. *American J.S.* 49 (3 S.) (1895): 249–270. **Taylor.**

Niagara and the Great Lakes. By Frank Bursley Taylor. *With Map and Sections.*

Mr. Taylor takes a middle course between the views of Professor J. W. Spencer and Mr. Warren Upham on the question of the geological history of the St. Lawrence.

North America. **Winsor.**

The Rival Claimants for North America, 1497–1755. By Justin Winsor. From *Proceedings of the American Antiquarian Society*, at the Annual Meeting, October 24, 1894. Worcester, Mass., 1895. Size 9½ × 6, pp. 22.

Shows the various ways in which the conflicting claims of the English and French in North America arose, and the principles on which they were based.

North America—Historical. **Winsor.**

The Mississippi Basin. The Struggle in America between England and France, 1697–1763, with full cartographical illustrations from contemporary sources. By Justin Winsor. Boston and New York: Houghton, Mifflin & Co., 1895. Size 9 × 6, pp. x. and 484. *Price* $4. *Presented by the Author.*

In this volume Mr. Justin Winsor continues his narrative of the progress of Discovery in North America and of the historical events connected with its settlement by Europeans. The period embraced is the important one in which England and France were rivals for supremacy in the Mississippi Basin, and the course of events is traced with great clearness down to the treaty of Paris, which gave England control of the whole territory from the sea-board to the Mississippi. As in the former volume, the history is elucidated by a valuable collection of reproductions of contemporary maps.

North American Ethnology. **Dorsey.**

A Study of Siouan Cults. By James Owen Dorsey. Eleventh Annual Report of the Bureau of Ethnology to the Secretary of the Smithsonian Institution, 1889–90. By J. W. Powell. Washington: Government Printing Office, 1894. Size 12 × 8, pp. 351–544. *Illustrations (some coloured). Presented by the Director of the U.S. Bureau of Ethnology.*

North American Ethnology. **Stevenson.**

The Sia. By Matilda Coxe Stevenson. Eleventh Annual Report of the Bureau of Ethnology to the Secretary of the Smithsonian Institution, 1889–90. By J. W. Powell. Washington: Government Printing Office, 1894. Size 12 × 8, pp. 1–158. *Plates (some coloured). Presented by the Director of the U.S. Bureau of Ethnology.*

North American Ethnology. **Thomas.**

Report on the Mound Explorations of the Bureau of Ethnology. By Cyrus Thomas. Twelfth Annual Report of the Bureau of Ethnology to the Secretary of the Smithsonian Institution, 1890–91. By J. W. Powell. Washington: Government Printing Office, 1894. Size 12 × 8, pp. 1–742. *Map and Illustrations. Presented by the Director of the U.S. Bureau of Ethnology.*

The recent examination of the ancient mounds of the United States leads the writer (*inter alia*) to the following conclusions: that the Indians and mound-builders are one and the same people; that particular works are attributable to tribes known to history; that the builders were not Mayas or Mexicans, or related to the Pueblo tribes of New Mexico; and that many of the mounds were built subsequently to the advent of Europeans.

North American Ethnology—Dakota Grammar, etc. **Riggs.**

Dakota Grammar, Texts, and Ethnography. By Stephen Return Riggs. Edited by James Owen Dorsey. Department of the Interior, U.S. Geographical and Geological Survey of the Rocky Mountain Region, J. W. Powell in charge. Contributions to North American Ethnology, volume ix. Washington: Government Printing Office, 1893. Size 12 × 9, pp. xxxii. and 240. *Presented by the Director of the U.S. Bureau of Ethnology.*

Includes notes on the Dakota tribes, their myths, migrations, etc., collected by the late Dr. Riggs during nearly fifty years' work among them.

United States. **Latané.**

Johns Hopkins University Studies in Historical and Political Science. Thirteenth Series, iii.–iv. The Early Relations between Maryland and Virginia. By John H. Latané. Is History past Politics? By the Editor. Baltimore, 1895. Size 10 × 6½, pp. 82.

United States—Colorado River. **Powell.**

Canyons of the Colorado. By J. W. Powell. Meadville, Pa.: Flood and Vincent, 1895. Size 12 × 9, pp. 400. *Portrait and Illustrations. Presented by the Publishers.*

This handsome and profusely illustrated volume, by the former Director of the United States Geological Survey, is to be welcomed as the first complete popular account of the important scientific expedition which explored the wonders of the Colorado region between the years 1869 and 1872. The scientific results, which formed its main object, have, of course, long since been published; but though Major Powell was induced to add to his report in 1875 a reproduction of his daily journal, no popular history of the expedition, commensurate with its importance as the basis of all our knowledge of that interesting region, had till now appeared. The illustrations have been brought together from a variety of sources, some of them having already appeared in the original report, and give a vivid idea, not only of the natural wonders of the country, but of the difficulties and dangers which were surmounted by the members of the expedition.

United States—Gravity Measurements. **Putnam and Gilbert.**

Results of a Transcontinental Series of Gravity Measurements, by George Rockwell Putnam; and Notes on the Gravity Determinations reported by Mr. G. R. Putnam, by Grove Karl Gilbert. Washington, 1895. Size 9½ × 6, pp. 46. *Plate. Presented by the Authors.*

United States—Maryland—Baltimore. ———

Report of the City of Baltimore Topographical Survey, to the Mayor and City Council of Baltimore, for the fiscal year ending December 31, 1894. Baltimore: W. J. C. Dulany, 1895. Size 9 × 6, pp. 220. *Maps. Presented by Josiah Pierce, Esq., Jr.*

United States—Minnesota—Itasca State Park. **Brower.**

The Report of the Commissioner of the Itasca State Park to His Excellency Knute Nelson, Governor, December 8, 1892, to December 1, 1894. St. Paul, Minn., 1895. Size 9 × 6, pp. 48. *Maps and Illustrations.*

United States—Oregon. *National G. Mag.* **6** (1895): 239-284. **Mitchell.**

Oregon, its History, Geography, and Resources. By John H. Mitchell.

CENTRAL AND SOUTH AMERICA.

Brazil—Guarani Language. **Restif.**

Lexicon Hispano-Guaranicum "Vocabulario de la lengua Guaraní" inscriptum a Reverendo Patre Jesuita Paulo Restivo . . . redimpressum necnon praefatione notisque instructum opera et studiis Christiani Frederici Seybold. Stuttgart: W. Kohlhammer, 1893. Size 8 × 5½, pp. x and 546. *Presented by the Publisher.*

Brasil—Guarani Language. **Restif.**

Linguae Guarani Grammatica Hispanice a Reverendo Patre Jesuita Paulo Restivo . . . redimpressa necnon praefatione notisque instructa opera et studiis Christiani Frederici Seybold. Stuttgart: W. Kohlhammer, 1892. Size 8 × 5½, pp. xiv. and 330. *Presented by the Publisher.*

These reprints of the Guarani Grammar and Vocabulary, published by the Jesuit Paul Restif in 1722, were suggested by the late Emperor of Brazil, as a contribution to the Columbus celebration in 1892, and carried out after his death under the auspices of Prince Peter of Saxe Coburg and Gotha. They are made from the single copy known to exist in Europe, which was presented to that prince by Dr. J. Platzmann of Leipzig. Their value depends not only upon the rareness of the original work, and its importance for the study of the Guarani language, but also on the light which it throws on the changes to which that language has been subject since the beginning of last century. A preface and notes are supplied by the editor, Dr. C. F. Seybold.

Chile. ———

Anuario Hidrografico de la Marina de Chile. Año 17. Santiago de Chile, 1894. Size 10 × 7, pp. 472. *Plates. Presented by the Chilian Admiralty.*

Guiana. **Rodway.**

In the Guiana Forest. Studies of Nature in relation to the struggle for life. By James Rodway. With Introduction by Grant Allen. Second Edition. London: T. Fisher Unwin, 1895. Size 8 × 5½, pp. xxiv. and 242. *Illustrations. Price 7s. 6d.*

This is a valuable book, written with much sympathy for nature, keen scientific insight, and expressed in clear and graceful language.

Nicaragua Canal. **Hurst.**

Nicaragua Canal. By Thomas Wright Hurst. From *Clay Record*, April 12, 1895. Size 11½ × 9½, pp. [4].

Advocates the choice of the Darien route for a ship canal in preference to that by Lake Nicaragua.

Uruguay. **Brendel.**

Uruguay. Von K. Brendel.—Festschrift d. G. Ges. in München. Munich: T. Ackermann, 1894. Size 10 × 6½, pp. 23–48.

Uruguay. **Gummá y Marti.**

Cuarto Centenario del Descubrimiento de América. Inmigración y Colonización Europea en la República Oriental del Uruguay trabajo presentado al Congreso Geográfico Hispano-Portugués-Americano por Alfredo Gummá y Marti. Barcelona, 1894. Size 11 × 7½, pp. 38. *Presented by the Author.*

AUSTRALASIA.

New South Wales—Geology. **Etheridge.**

Department of Mines and Agriculture. Memoirs of the Geological Survey of New South Wales. Palæontology, No. 8. Contributions to a Catalogue of Works, Reports, and Papers on the Anthropology, Ethnology, and Geological History of the Australian and Tasmanian Aborigines. Part III. By R. Etheridge, Junr. Sydney: C. Potter, 1895. Size 12½ × 10, pp. 40. *Presented by the Minister for Mines and Agriculture, New South Wales.*

New South Wales—Meteorology. **Russell.**

Results of Rain, River, and Evaporation Observations made in New South Wales, during 1893, under the direction of H. C. Russell. Sydney: C. Potter, 1894. Size 9½ × 6, pp. l. and 176. *Maps and Diagrams. Price 3s. 6d.*

Queensland—Artesian Water. **Jack.**

Queensland. Department of Mines. Geological Survey. Bulletin No. 1. Artesian Water in the Western Interior of Queensland. By Robert L. Jack. Brisbane: E. Gregory, 1895. Size 9 × 5½, pp. 16. *Presented by the Author.*

POLAR REGIONS.

Arctic Expedition. *B. G. Club Philadelphia* 1 (1894–95): 121–123. **Peary.**

Preliminary Report on the Arctic Expedition of 1893–94. By Civil Engineer Robert E. Peary.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Astronomy. **Peal.**

A Theory of Lunar Surfacing by Glaciation. By S. E. Peal. Calcutta: Thacker, Spink and Co., 1889. Size 9½ × 6½, pp. 26. *Illustrations. Presented by the Author.*

Atmosphere—Bibliography. ———

Catalogue of Works on Atmospheric Physics and Climatology. Library of Lorin Blodget.—From Proceedings commemorative of the One Hundred and Fiftieth Anniversary of the Foundation of the American Philosophical Society . . . May 22–26, 1893, pp. 248–269. Philadelphia, 1894. Size 9½ × 6.

Books of Reference. ———

Connaissance des Temps ou des Mouvements Célestes, pour le Méridien de Paris, à l'usage des Astronomes et des Navigateurs, pour l'an 1897, publiée par le Bureau des Longitudes. Paris: Gauthier-Villars et Fils, 1894. Size 9½ × 6½, pp. vi., 756, and 108. *Charts.*

Coasts and Coast Settlements. **Ratzel.**

Zur Küstenentwickelung. Anthropogeographische Fragmente. Von Friedrich Ratzel. Festschrift d. G. Ges. München. Munich: T. Ackermann, 1894. Size 10 × 6½, pp. 67–90.

Entomology. **Elwes.**

Address to the Entomological Society. [By — Elwes.] Size 8½ × 5½, pp. 36.

Deals mainly with the question of Entomological Regions.

Geography of Plants. **König.**

Naturwissens. Wochenschrift 10 (1895): 77–81, 95–98, 117–124.

Die historische Entwickelung der pflanzengeographischen Ideen Humboldts. Von Clemens König.

An investigation of the external influence to which Humboldt's ideas on the geography of plants may be ascribed.

Gravity-determinations. ———

Relative Schwerebestimmungen durch Pendelbeobachtungen. Ausgeführt durch die K. und K. Kriegs-Marine in den Jahren 1892–1894. Herausgegeben vom K. und K. Reichs-Kriegs-Ministerium, Marine-Section. Wien: Carl Gerold's Sohn, 1895. Size 10½ × 7, pp. viii. and 630. *Maps and Plates.*

Meteorology—Winds. **Frejlach.**

Věstnik Král. České Společnosti Náuk. Třida mathematicko-přirodovědecká. 1894. XXXIV. Intorno all' andamento diurno che ha la frequenza di rotazioni del vento nell' intervallo di 4 ore a Praga. Dell Dott. Giuseppe Frejlach. Prague, 1894. Size 10 × 6½, pp. 10.

Meteorology—Winds. **Frejlach.**

Sitzungsberichte der Königl. böhmischen Gesellschaft der Wissenschaften. Mathematisch-naturwissenschaftliche Classe. 1895. II. Zur Kenntniss der anemometrischen Verhältnisse von Prag. Von Dr. Josef Frejlach. Prag, 1895. Size 9½ × 6½, pp. 4.

Zoogeography. **Beddard.**

A Text-Book of Zoogeography. By Frank E. Beddard. Cambridge: the University Press, 1895. Size 7½ × 5, pp. viii. and 246. *Maps. Price 6s. Presented by the Cambridge University Press.*

An outline of the leading facts and conclusions of zoological distribution, based largely on the works of Wallace and others, but as far as possible illustrated by instances not previously made use of, and brought up to date from recent sources of information. The work should be useful as an introduction to the interesting subject with which it deals.

GENERAL.

Anthropology. **Sergi.**

Smithsonian Miscellaneous Collections, 969. The Varieties of the Human Species. Principles and Method of Classification. By Giuseppe Sergi. Washington: the Smithsonian Institution, 1894. Size 9½ × 6, pp. 62. *Illustrations. Presented by the Smithsonian Institution.*

An attempt at a systematic classification of the human species into varieties and subvarieties, according to definite variations in the shape of the skull, sixteen typical shapes, corresponding to as many human varieties, being laid down.

Bimetallism. **Jamieson and others.**

The Silver Question. Injury to British Trade and Manufactures. The paper by George Jamieson which won the Bimetallic Prize offered by Sir Henry M. Meysey-Thompson in 1894, together with two other papers on the same subject by Thomas Holyoake Box (Yokohama); and David Octavius Croal (London); also a Preface and Sequel by Sir Henry M. Meysey-Thompson, Bart., M.P. London: Effingham Wilson, 1895. Size 9½ × 6, pp. vi. and 76. *Price 6d. Presented by the Publisher.*

Biography—Daendels and Raffles. **Deventer.**

Daendels-Raffles. A dissertation on the two celebrated Governors of Java during one of the most important periods in the history of the Dutch Colonies in the East Indies. By M. L. Van Deventer. Translated from the 'Indische Gids' by Geo. G. Batten. London: printed . . . . by E. Marlborough & Co., [1894]. Size 8½ × 5½, pp. 128.

Biography—Westenrieder. **Gruber.**

Die Verdienste Lorenz von Westenrieders um die bayerische Geographie. Von Dr. Christian Gruber. Festschrift d. G. Ges. München. Munich: T. Ackermann, 1894. Size 10 × 6½, pp. 91–118.

Cities. **Reclus.**

The Evolution of Cities. By Elisée Reclus. [From the *Contemporary Review*, February, 1895.] Size 10 × 6½, pp. 19. *Presented by the Author.*

Columbus. *Rev. G.* **36** (1895): 189-199, 252-260. **Levasseur.**

Christophe Colomb d'après la Raccolta di Documenti e Studi pubblicati dalla R. Commissione Colombiana del Quarto Centenario dalla Scoperta dell' America par E. Levasseur.

Decimal System. **Walmsley.**

The Decimal Problem and its Urgency, with some remarks on its solution. By Professor R. Mullineux Walmsley. Size 8½ × 6, pp. [16]. *Presented by the Author.*

Educational—Textbook. **Molard.**

Cours de Géographie rédigé conformément au nouveau programme d'admission à l'École Spéciale Militaire pour 1891. Par J. Molard. Europe. With Atlas. Paris: Jouvet & Co., 1891 (Atlas, 2nd edition, 1895). Size 7½ × 5 (Atlas, 13 × 10), pp. viii. and 336. *Price (Text and Atlas), 11s.*

This deals with the first section (Europe) of the programme for the Study of General Geography laid down for candidates for admission into the French Special Military School. The Physical Geography of Europe is first treated of in detail, the main features of orography, hydrography, etc., being clearly shown in the large series of physical sketch-maps included in the Atlas. In the political section the main idea kept in view is that of the influence which the configuration of the earth has had on the distribution of the human race.

Educational. *Deutsche G. Blätter* **18** (1895): 35–46. **Oppel.**

Ueber die Stellung und Behandlung der Wirtschaftsgeographie im Schulunterricht. Von A. Oppel.

Educational. ———

The Value of Geography as an Educational Instrument; with some hints on its teaching in schools. [From the *Australian Teacher*. Vol. i. No. 10, November, 1894, pp. 2-7.] Size 11 × 9. *Presented by A. H. Coombes, Esq.*

Geodesy. **Weiss and Schram.**
Publicationen für die Internationale Erdmessung. Astronomische Arbeiten des K. K. Gradmessungs-Bureau ausgeführt unter der Leitung des Hofrathes Theodore v. Oppolzer. Nach dessen Tode herausgegeben von Prof. Dr. Edmund Weiss und Dr. Robert Schram. VI. Band. Längenbestimmungen. Vienna: F. Tempsky, 1894. Size 12½ × 10, pp. 196. *Presented by the K. K. österreichische Gradmessungs-Bureau.*

Geographical Discovery. *B.G. Club Philadelphia* 1 (1894–95): 85–120. **Heilprin.**
The Progress of Discovery and the Lands of Promise to the Explorer. By Prof. Angelo Heilprin.

History of Geographical Measurement. **Ambronn.**
Deutsche G. Blätter 18 (1895): 46–63.
Das was uns im Laufe der Zeit über Grösse, Gestalt und Masse der Erde bekannt geworden ist. Von Dr. Ambronn.

Magnetism. *J.S. Arts* 43 (1895): 558-567. **Reinold.**
Deviation of the Compass. By Prof. A. W. Reinold.

Malay Archipelago—Bima-Dutch Dictionary. **Jonker.**
Bimaneesch-Hollandsch Woordenboek. Door J. C. G. Jonker. Verhandelingen van het Bataviaasch Genootschap van Kunsten en Wetenschappen, Deel xlviii. 1ste Stuk. Batavia, 1893. Size 10½ × 7½, pp. 134.

Mohammedan Countries. **Hirth.**
Supplément au Volume V. du "T'oung-pao." Die Länder des Islâm nach Chinesischen Quellen. Von Prof. Dr. Friedrich Hirth. Leyden, E. J. Brill, 1894. Size 10 × 6½, pp. 64. *Presented by the Author.*

Mountaineering. **Mummery.**
My Climbs in the Alps and Caucasus. By A. F. Mummery. London: T. Fisher Unwin, 1895. Size 11 × 7½, pp. xii. and 360. *Illustrations. Price* 21*s. Presented by the Publisher.*

This work will be specially noticed.

Ore-Deposits. **Sjögren.**
Beiträge zur Kenntniss der Erzlagerstätten von Moravica und Dognacska im Banat und Vergleichung derselben mit den schwedischen Eisenerzlagerstätten. Von Hj. Sjögren. [From Jahrbuch der k. k. geol. Reichsanstalt, 1886, 36 Band. 4 Heft.] Size 10½ × 7½, pp. [62]. *Presented by the Royal University of Upsala.*

Origin of Species. **Soria y Mata.**
Arturo Soria y Mata. Origen Poliédrico de las Especies. Unidad, origen, reproducción y síntesis de las formas. Madrid, 1894. Size 9 × 6½, pp. 86. *Illustrations.*

NEW MAPS.

By J. Coles, *Map Curator*, R.G.S.

EUROPE.

Alps. **Penck and Richter.**
Atlas der Österreichischen Alpenseen mit Unterstützung des hohen k. k. Ministeriums für Cultus und Unterricht; herausgegeben von Dr. Albrecht Penck und Dr. Eduard Richter. I. Lieferung: Die Seen des Salzkammergutes 18 Karten und 100 Profile auf 12 Tafeln. Hauptsächlich nach den lothungen von Hofrath Dr. Friedrich Simony em. Prof. der Geographie an der Universitat Wien, entworfen und gezeichnet von Dr. Johann Müllner. Wien, 1895. *Presented by Dr. Albrecht Penck.*

This is the first issue of an atlas containing maps of the lakes in the Austrian Alps. The depths of the lakes, and the elevations of the surrounding country, are represented by figures and a series of contours. In addition to this the maps are orographically coloured, and a section of each lake is given.

England and Wales. **Ordnance Survey.**

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Hornsey, II. 60, 1, 4, 2*s*. 6*d*. each.

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England. **Bartholomew.**

The New Reduced Ordnance Survey Map of the County of Surrey. By J. G. Bartholomew, F.R.G.S. Scale 1 : 126,720 or 2 stat. miles to an inch. W. H. Smith & Son, London. *Price 2s., mounted on cloth. Presented by J. Bartholomew & Co.*

This is one of Bartholomew's reduced Ordnance Survey Maps. The roads are coloured brown, the elevations are given in feet, and it is well suited to the wants of cyclists and pedestrians.

Flag Maps. **Morley.**

Flag Maps (patented by H. Morley, Stockport):—1. England. Geographical Lessons and "Occupation" combined. For the use of younger children in School Classes. W. & A. K. Johnston, Edinburgh and London. *Price 8d. Presented by the Publishers.*

Russia. **Bober.**

Dislokations-Karten der gesammten Russischen Armee (2 Blatt) und Tabellaris Uebersichten der Eintheilung der russischen Armee in Europa und in Asien. Entworfen von Bober, Hauptmann und Kompagnie-Chef im Infanterie-Regiment Freiherr Hiller von Gaertringen (4 Posenschen) Nr. 59. Ernst Siegfried Mittler & Sohn, Berlin, 1895. *Price 15s. 6d.*

Switzerland. **Handtke and Herrich.**

Schweiz, bearbeitet von F. Handtke und A. Herrich. Scale 1 : 600,000 or 9·4 stat. miles to an inch. Carl Flemmings Generalkarten. No. 21. Druck und Verlag von Carl Flemming in Glogau. *Price* 1·5 *mark.*

As this map is of handy size, and clearly shows all means of communication, as well as the topographical features of the country, it is well suited to the requirements of tourists visiting Switzerland.

ASIA.

Indian Government Surveys. **Surveyor-General of India.**

Indian Atlas, 4 miles to an inch, Sheet 47, parts of Ludhiana, Jullundur, etc. (Punjab), and parts of district Dehra Dun and the Native State of Gurhwal (North-West Provinces). Quarter Sheets, 15 S.W., parts of districts Bannu, Dera Ismail Khan, Shahpur, and Kohat (Punjab); 31 N.W., parts of districts Ferozepore, Montgomery, Lahore, and of Native States Bahawalpur (Punjab) and Bickaneer (Rajputana); 60 S.E., parts of districts Mysore, Bangalore, Tumkur, and Kolar (Mysore), and of Salem and Coimbatore (Madras Presidency); 67 S.W., parts of districts Bareilli, Budaun, Aligarh, Etah, Moradabad, Bulandshahr, Shahjahanpur, and of Rampur Native State (North-West Provinces); 91 S.E., parts of Raipur, Nawagarh, Khariar, Borasamar, Patna, and Phuljhar (Central Provinces); 129 N.E., parts of district Lakhimpur (Assam), and the Miri and Mishmi Hills; 131 N.W., parts of districts Cachar and Naga Hills and Manipur (Native States).—India, 1 inch to 256 miles, 1894.—Skeleton Map of the Punjab and surrounding countries, 1874, Corrections to 1892, 1 inch to 32 miles.—Bombay Survey, 1 inch to a mile, No. 159, parts of districts Surat, Thana, Násik, and Daman (Portuguese Territory), and Dharampor State, Seasons 1874-75, 1882-83, and 1891-92; No. 206, parts of Ratnagiri District and Kolhápur and Bavda States, Season 1892-93; No. 207, parts of district Ratnagiri and Kolhapur, Bavda, and Savantvadi States, Season 1892-93; No. 227, districts Nasik and Ahmednagar, Seasons 1871-73; No. 241, parts of district Belgaum and Kolhapur and Inchalkaranji States, Season 1892-93; No. 303, parts of Belgaum District and Mudhol, Jamkhandi, Aundh, Kurundvad, and Sangli States, Season 1892-93.—Bengal Survey, 1 inch to a mile, No. 207, districts Hazaribagh and Sonthal-Parganas, Season 1848; No. 359, district Mymensingh, Season 1856-57.—Hyderabad Survey, 1 inch to 2 miles, Nos. 101, 102, 103, 125, 126, 127, Mulkaid Circar, Season 1824-25; Nos. 128, 168, 169, Bhonagheer Circar, Season 1827-28.—Lower Burma Survey, 1 inch to a mile, districts Hanthawaddy and Thongwa, Seasons 1881-82 and 1887-90; Nos. 563, 570, 571, 579, 580, 581, district Mergui, Seasons 1889-93.—North-West Provinces and Oudh Survey, 1 inch to a mile, No. 46, districts Bijnor, Moradabad, Garhwal, and Naini Tal, Seasons 1868-69, 1873-76, 1888-90; No. 100 (2nd edit.), districts Pilibhit and Kheri, Seasons 1865-66 and 1869-70; No. 250, districts Naini Tal and Almora, Seasons 1872-73 and 1888-90; No. 251, districts Naini Tal and Almora, Seasons 1872 and 1888-90.—North-Eastern Frontier, 1 inch to 4 miles, part of Sheet No. 15 S.W., parts of district Cachar, Manipur Native State, and North Lushai Hills (Assam), and of Chin Hills (Burma), Season 1893-94.—South-Eastern Frontier, 1 inch to 4 miles, No. 6 N.W. (7th edit.), parts of district Toungoo (Lower Burma), of district Yamethin, of South Shan States and Karenni (Upper Burma), and of Siam, Seasons 1887-94.—Indus Riverain Survey, 1 mile to an inch, No. 40, district Shikarpur and Khairpur State, Season 1892-93; No. 59, district Shikarpur and Khairpur State, Season 1892-93; No. 78, district Upper Sind Frontier, Season 1892-93; No. 79, districts Upper Sind Frontier and Shikarpur, Season 1892-93; No. 80, districts Upper Sind Frontier and Shikarpur, Season 1892-93; No. 98, districts Dera Ghazi Khan, Upper Sind Frontier, and Shikarpur, and Bahawalpur State, Season 1892-93; No. 99, districts Upper Sind Frontier and Shikarpur, and Bahawalpur State, Season 1892-93; No. 60 and portion of No. 81, district Shikarpur and Khaipur State, Season 1892-93.—District Kámrúp, Assam, 4 miles to an inch, 1894.—District Mymensingh, Lower Provinces, Bengal, 4 miles to an inch, 1894.—District Gorakhpur, 1883-88, 2 miles to an inch, 1894, 6 sheets.—Survey of India Department, Chart of Triangulation of No. 18 party (Himalaya), Sheet No. 290 (Punjab), 1 inch to 2 miles, Season 1884-85.—Central Provinces Survey, index to the Forest Survey in district Damoh, No. 14 party, 1894.—*Presented by H.M. Secretary of State for India, through the India Office.*

AFRICA.

Africa. **Société de Géographie de Paris.**

Afrique, 1895. Scale 1 : 10,000,000 or 157·8 stat. miles to an inch. Dessinée par J. Hansen. Société de Géographie de Paris. Maison Andriveau-Goujon. H. Barrère, Paris.

Orange Free State. **Herfst.**

School Kaart van den Oranjevrijstaat samenjesteld door J. J. Herfst, vervaardiger van de Ordinantie kaart van den Oranjevrijstaat. Scale 1 : 780,000 or 12·6 stat. miles to an inch. C. Borckenhagen & Co., Bloemfontein. *Presented by C. B. Elliott, Esq.*

AUSTRALIA.

Australia. **Bartholomew.**

Commercial map of Australia. By J. G. Bartholomew, F.R.G.S. Scale 1 : 6,000,000 or 94·6 stat. miles to an inch. J. Bartholomew & Co., Edinburgh. *Price 3s., mounted on cloth. Presented by the Publishers.*

This map has been drawn for the use of persons having business connections with Australia. Special attention has been given to the railways, steamer routes, telegraph lines and cables. It is also well adapted for general reference, having been very nicely drawn and carefully brought up to date.

GENERAL.

Historical Geography. **Schrader.**

Atlas de Géographie Historique, ouvrage contenant 54 grandes Cartes doubles en couleurs, accompagnées d'un Texte Historique au dos et d'un grand nombre de cartes de détail, figures, diagrammes, etc. Par une Réunion de Professeurs et de Savants sous la direction géographique de F. Schrader, directeur des travaux cartographique de la librarie Hachette et C^{ie}. 14^{e} Livraison. Paris: Librairie Hachette et C^{ie}, 1895. *Price 1fr. 50c. each part. Presented by the Publishers.*

Part 14 of this atlas contains the following maps: the countries bordering on the Mediterranean at the time of Justinian; the Eastern Empire towards the middle of the tenth century; the Church at the time of Gregory the Great; France and the neighbouring countries in the year 987, with three insets of France at the accession of Hugues Capet, at the beginning of the reign of Henry I., and in the eleventh century; France in 1681; the United Provinces during the seventeenth century; Sweden after the treaty of 1660; the Orient after the treaty of Carlowitz. These maps are all well drawn, and are accompanied by well-written explanatory notes.

The World. **The "Times."**

The Times Atlas. Published at the *Times* Office, London. Parts 10, 11, 12, 13. Complete in fifteen weekly parts. *Price 1s. each part. Presented by the Publishers.*

The present issues of this atlas contain the following maps: Part No. 10—North Polar Regions and four insets, Afghanistan and Baluchistan, Siam and Malay Archipelago (one inset), Southern Scandinavia and one inset, Norway and Sweden, The Caucasus, Greece and one inset. Part No. 11—North-West Africa and one inset, United States, Belgium and Luxemburg, Holland, Spain and Portugal. Part No. 12—China and Japan with two insets, Japan and five insets, North-East Africa, North America, Australia and New Zealand with two insets.

The World. **Philip.**

The Religions of the World, with the stations of the London Missionary Society. Compiled and published for the London Missionary Society, by George Philip & Son, London and Liverpool, 1895. *Price 6d. Presented by Messrs. G. Philip & Son.*

CHARTS.

Pilot Charts. **U.S. Hydrographic Office.**

Pilot Charts of the North Atlantic Ocean for June, 1895, and North Pacific Ocean for July, 1895. Published monthly at the Hydrographic Office, Washington, D.C. Charles D. Sigsbee, Commander U.S. Navy, Hydrographer. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Antarctic Regions. **Bruce.**

23 Photographs taken in the Antarctic Regions in the neighbourhood of the South Shetland Islands, etc., by Mr. W. S. Bruce, on board the *Balæna*, 1893. *Presented by B. Leigh Smith, Esq.*

This series of photographs was taken by Mr. W. S. Bruce on board the *Balæna*, during a cruise towards the Antarctic in 1893.

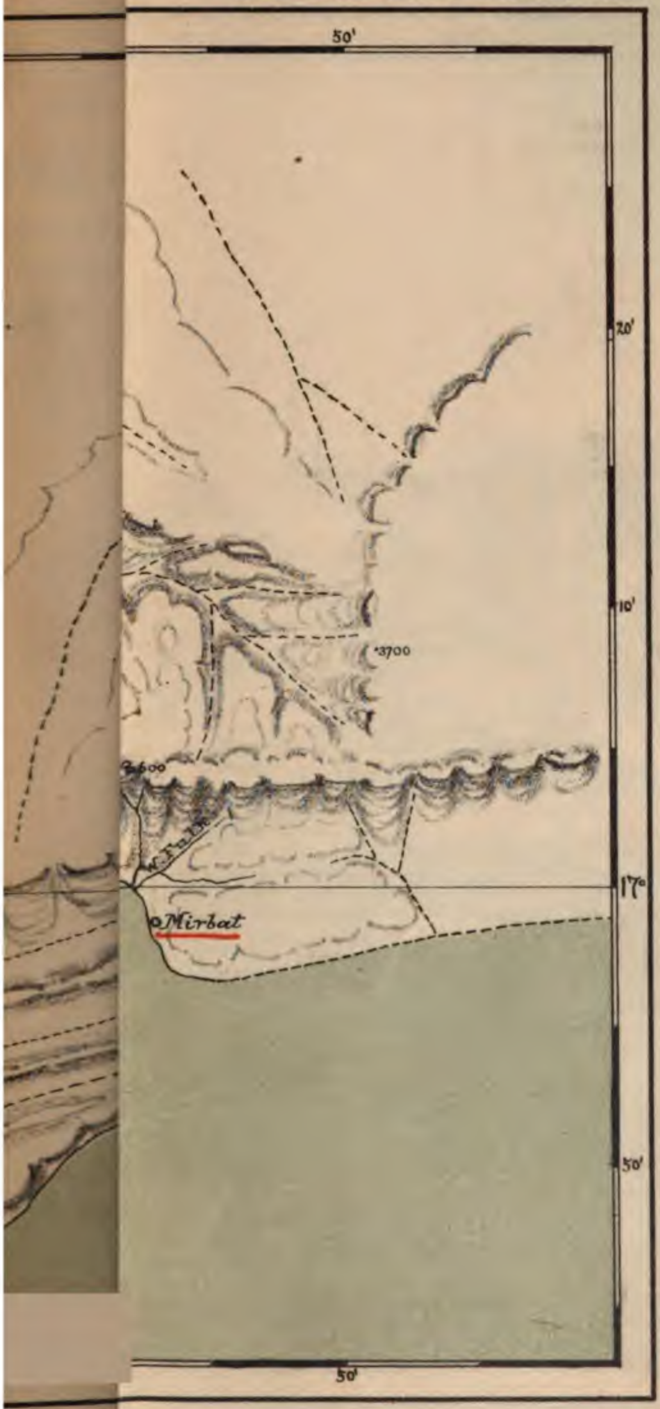
Japan. **Weston.**

21 Photographs of Natives and Scenery of Japan, taken by the Rev. Walter Weston. *Presented by Rev. Walter Weston.*

This is a very well-chosen set of photographs, illustrating the scenery of Japan.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

THE GEOGRAPHICAL JOURNAL, 1895.



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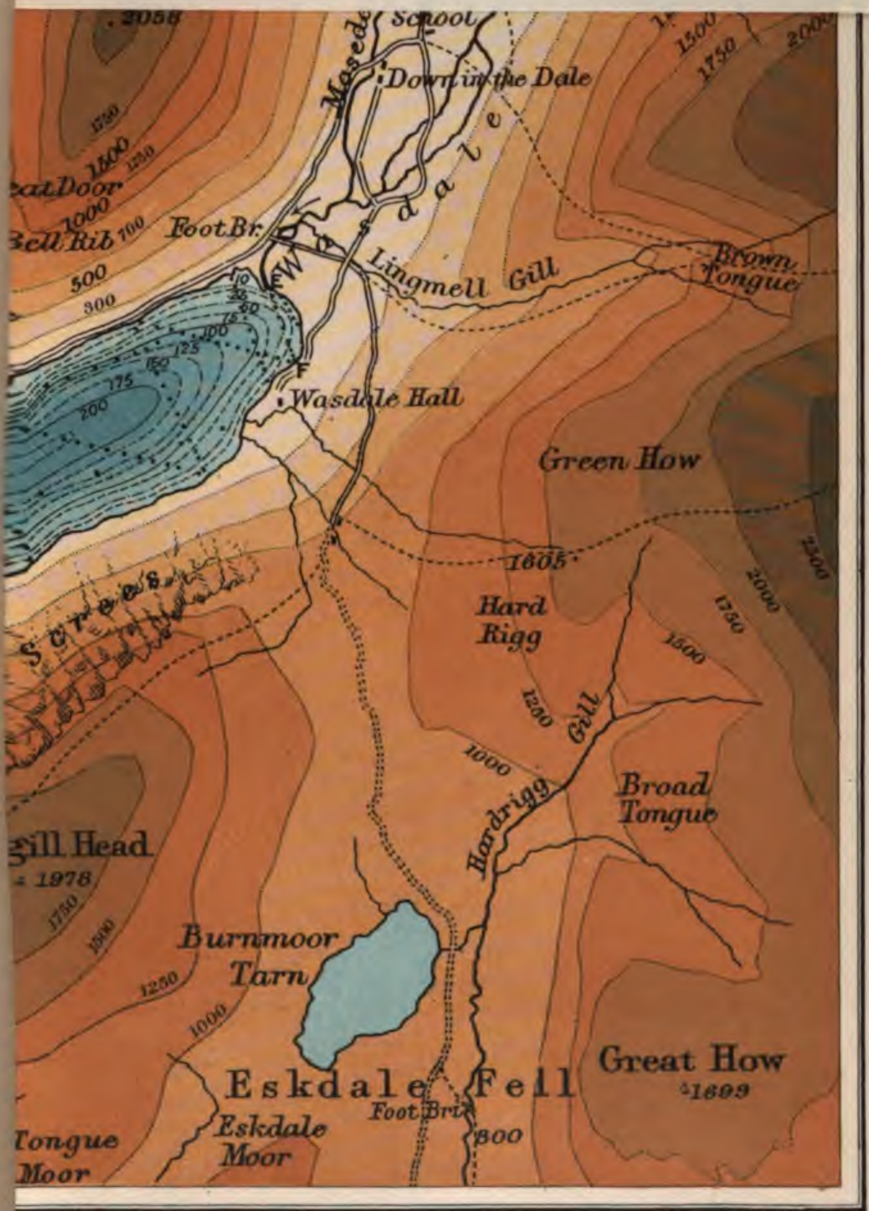

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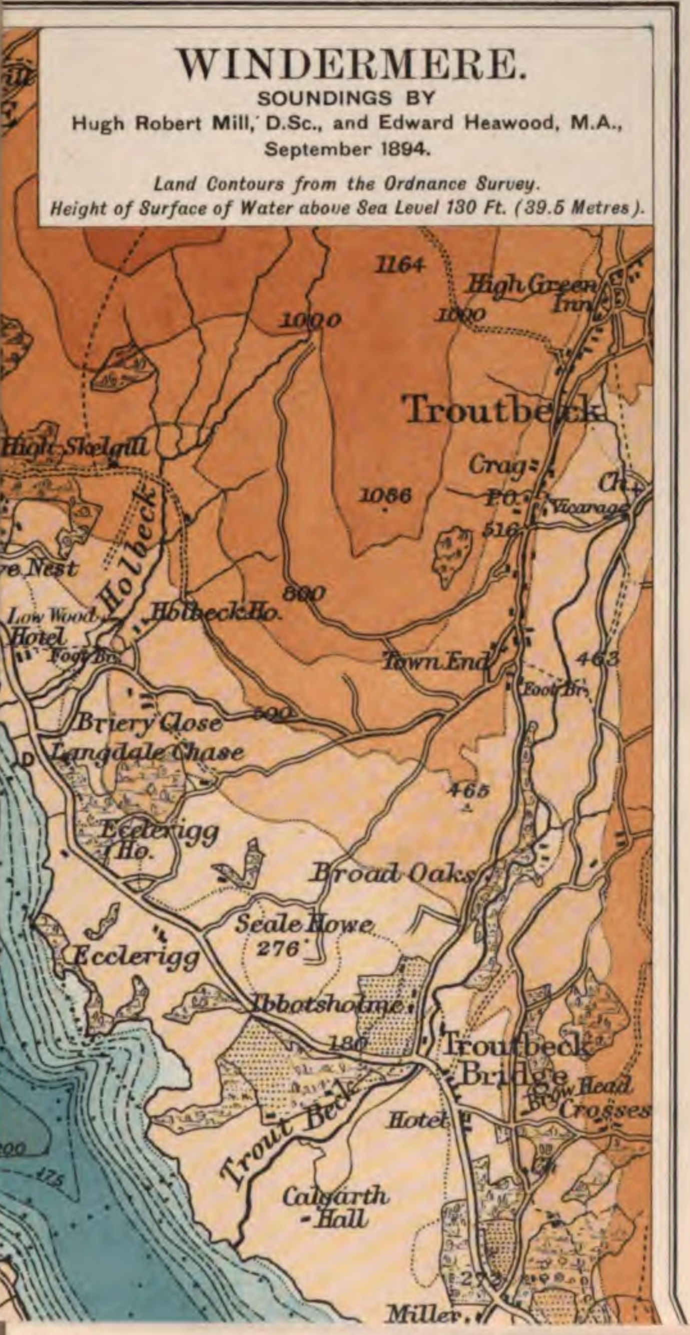
oyal Geographical Society.

WINDERMERE.

SOUNDINGS BY
Hugh Robert Mill, D.Sc., and Edward Heawood, M.A.,
September 1894.

Land Contours from the Ordnance Survey.
Height of Surface of Water above Sea Level 130 Ft. (39.5 Metres).



or lowlying lands submerged by the rising tide or the winter floods, the dark silent mangrove forest keeps watch. Nor foot of man nor foot of beast has trodden large areas of these pathless thickets—save, perhaps, some stray homeless elephant—since the days of an elder creation. One's imagination can fancy the giant lizards and extinct amphibians without incongruity in such desolate wilds. But to-day all nature is still; neither bird nor monkey disturbs the silence, unless it be some long-legged wader or solemn crane. The mangrove trees themselves seem to have lost count of the vegetable proprieties, and stand as it were on stilts with their branches tucked up out of the wet, and leave their gaunt roots exposed in mid-air. Branches (or shall I call them roots?) leave the parent trunk 10 or 12 feet above ground, and strike downwards into the sluggish water to form a prop which is neither root nor branch. Here we may see a tree beginning its individuality on a tripod of such branch-roots 10 feet above the ground, while its neighbours are linked by boughs which grow out of one tree-trunk into another, and form a Siamese link, as though there were a sense of humour in the vegetable world, and these weird trees had spent their endless leisure in forming themselves into living conundrums. On their water-washed roots shell-fish are fastened, so that the Irishman's paradox of oysters growing on trees has here a literal fulfilment.

MOUTH OF NIGER FROM AKASSA STATION.
(*From a photograph by Dr. W. H. Crosse.*)

To such a medley of unsightly tree-forms the contrast of the bank of forest which borders the river-side when the mangrove swamps are past, is a welcome and a pleasing contrast. This fringe of forest is exquisite both in colouring and in form. In colouring, because mingled with every tint of green are masses of scarlet and yellow and purple blossom; in form, because interlaced with the giant mahogany and cotton trees are the waving fern-like fronds of the oil palm and still more beautiful raphia. The earlier reaches of the Niger are therefore a panorama of beautiful colour, through which the mile-broad river flows. As a rule the navigation presents few difficulties, except in the season of drought, when the varying sand-deposits choke the course of the stream at certain well-known points. At lowest water, however, when the current has selected the channels in which it will flow, the sand is to some extent washed out of these, and renders them comparatively easy once more. Giant trees borne down in the floods and partly buried in the sandbanks form dangerous snags, which have cost the Niger Company more than one valuable steamer. As we near Lokoja at the junction of the great river Benue, the character of the country changes completely, and rugged bare hills rise up in every perspective, replacing the level undulations and forests of the lower river. Above the confluence of the Benue the Niger narrows somewhat, and takes a great bend to the west, straightening itself again into its north and south direction just before the cataracts (which break the navigation) are reached.

Here on a river-island, near which towers a giant rock from mid-stream, and the wreck of H.M.S. *Day Spring* can still be traced, is the station of Jebba, some 550 miles from the sea.

Telegraphic instruction had been sent from England to purchase donkeys for my expedition, but there was a dearth of asses in the land, owing to local feuds in the Hausa country, and in place of 200 I found a bare 50, which were further reduced to 34. The balance had very sensibly preferred to die rather than face an expedition in the rains. Those that were left discovered their error very quickly, and proceeded to die off as fast as they could. This arrangement suited their convenience, but did not suit mine, for as each ass took the fatal decision and departed for a better world, he left behind him two loads, transport for which it devolved upon me to provide as best I could. This difficulty was overcome by engaging men, and even women, to carry loads from village to village. One stalwart lady selected a great awkward square bale weighing some 80 lbs., which had been evaded by the regular porters, and marched off with it at the head of the caravan. Next day she appeared before my tent in grief. I expected a story of wrongs endured, and gave her my whole attention. Never before had I employed a female porter, but necessity knew no law, and now I was ready to vindicate her rights. It transpired that her grievance was, that some unknown villain had taken her load, and left her with but an insignificant little bale to carry. Nor was she easily pacified. From this you may judge that if civility to the fair sex be a trait of African character, it is often due to the strength of circumstances, and of the lady's right arm.

To return to our asses. Finding that the bales of goods I had brought from England (cloth for food-purchase and payments of all sorts; valuable velvets, plushes, damasks, and embroidery as gifts to chiefs, etc.) required some adjustment, and that a large body of men must be enlisted to replace the donkeys, I decided to make a hurried trip to Bussa, the Borgu chief who owns the districts bordering the Niger, whose town is 100 miles up river beyond the cataracts. The king is a gentleman of much local importance. His theory seemed to be that there were many white men, but only one Bussa. My theory coincided with his when I knew him better. I was grateful to Providence that there was only one Bussa. I began to have misgivings that if all West African chiefs were constructed on the lines of this my first acquaintance, the day would come when my patience would pay out. What would happen in that case would probably be of great interest to me at the moment, and to my executors afterwards.

THE NIGER FROM ASABA.
(From a photograph by Dr. W. H. Crosse.)

We lived in a Borgu hut, one of a little coterie of huts inhabited by peasant folk in common with their goats and fowls and babies. The younger women (who wore little or no clothes at all) pounded the grain and prepared the food. Our host was a weaver and made cloth, but he did not go in for an eight-hour day. I had pitched a tent, but the king of all the Bussas sent down a royal messenger to tell me that the particular spot by the river-side on which I was encamped was the one spot he desired, on which to go through some pagan ceremonies, so I had to clear out. The ceremonies were gone through. Their distinctive feature was a great deal of prancing about on diminutive ponies almost smothered with trappings, and a great deal of trumpet-blowing. These trumpets were an institution new to me, and I saw, or rather *heard*, more of them subsequently in Borgu than I cared for. On each state occasion the king is accompanied by two men, who carry these instruments of torture. They are some 6 feet long, shaped like a gigantic four-in-hand bugle. At odd minutes during the "palaver" (as West African state discussions with black potentates are called), the two ushers of the bugle place the end which isn't in their mouths as near to the king's ear as possible and give vent to an appalling instrumental yell. The noise is absolutely deafening even at a distance; to have it done into one's ear must make one feel like a lost soul in Hades. But the king never moves a muscle of his face. I suppose it is West African etiquette, but it must be hard to acquire. We waited five or six days before His very dirty Majesty consented to hear our business, which he did in a hovel in the company of a couple of goats. I explained that it was my intention to go into Borgu, and that I had come to ask him for letters to the king of Nikki, and for guides and an envoy, who should explain who I was, and should inform Nikki that for many years the king of Bussa had been the friend of the Royal Niger Company, and had never had any misunderstanding with them. This matter of *letters* is a very important one in West Africa. The letters are written in Arabic or Hausa (in the Arabic character), and are veritable passports. Without such credentials one is looked on with suspicion, whereas if one brings a recommendation of this sort, each chief writes a fresh one to his neighbour whom you propose to visit next. Here is the first part of one as a sample:

> This letter comes from Abdul Salami, Emir of Illorin, son of the late Suberu, Emir of Illorin, who was called Mallam, and whom they called Allimi, with salutations, etc., to Captain Lugard.
>
> You are our friend, our friend in this affair. You are not among the warriors; you a traveller in many towns of different people. Look now, he is a traveller on account of buying and selling and of all trades. You should hear this. He spoke well to us; he says there is no plundering, no mischievous doings between you and I, but peace and friendship in all ways. This is what the people of the world are hearing; they came to me with friendship. This friendship, love, and respect, etc., should exist between you and I. You people of Borogun (Borgu) like the King of Kishi. If he come to you, dismiss him with friendship; even so you should bring him in the hand of the King of Kaioma (Kiama), with my many compliments to the King of Kaioma, so that the agreement between you and I may exist, and dismiss him with friendship till he comes to the King of Nikki and give my compliments to him. And the King of Nikki should dismiss him with friendship till he comes to Kwampanisa and give my compliments to him.
>
> You should leave this white man alone. It is trade he requires of you; he is not of the wicked people, but peace.

Most of these letters begin by giving praise to God and to His Prophet Mahomet for "the gift of the pen by which we can make known our salutations and our wishes to our friends at a distance."

Here is a second letter referring to the negotiations regarding the Illorin-Lagos frontier:—

The Emir of Illorin, to Captain Lugard.

This letter comes from the servant of God; a letter to his friend Captain Lugard. I salute you, and am very glad of your arrival. How have you fared on the way? I am exceedingly glad of your arrival, and to hear that you have come in peace. Since you left I have been constantly praying that I may see you. After this I sat in my house, and God brought the time when we got peace with Ibadan. . . .

After detailing the points in dispute, he concludes somewhat quaintly in these words :—

I send you salutations. After these I send you a gift of a horse by my messenger. Ride on this horse and settle the trouble.

Bussa declined to give me any letter, saying that his envoy would say all that was required. He gave me a guide—in return for an outrageously large present—and said that the envoy should precede me by a shorter route, while I returned to Jebba. I never heard anything further about him; and even the guide would go no further than my first stopping-place in Borgu. I have reason to believe that Bussa was anxious I should never return. No white man had ever yet returned from the interior of Borgu. Wolf and Duncan had penetrated some distance, and never came back; Kling had been forced to turn back; and Mons. Hess was killed by a poisoned arrow before he had even crossed the frontier. So Bussa was naturally hopeful; but, in order to make sure, he was careful to give me no credentials, and later on, when a combination of marauders attacked us, we saw on the spot a

MANGROVE SWAMP.
(*From a photograph by Dr. W. H. Crosse.*)

man who had attracted our notice in Bussa's town. We parted from Bussa with no regrets. Mr. Watts, the very able and energetic administrator of the northern portion of the Company's territories, had accompanied me, and had been ill with violent fever most of the time. A Borgu hut in the rains is not the place or the time I would select to have my fever for choice, but, unfortunately, West African fever is by no means a matter of choice.

We came down the cataracts by canoe, and had a mild form of excitement in shooting some of the rapids, where the water boiled and eddied over some sunken rock and formed a very maelstrom, where to swim would be impossible.

Arrived at Jebba, I found that almost all the necessary men had been enlisted, and the other preparations I had initiated were complete. Not wishing to lose a single day, I started without any further delay. My expedition consisted of Messrs. Mottram and Reynolds, a couple of interpreters, 40 Hausa soldiers belonging to the Company's constabulary (who, unfortunately, were for the most part recruits), some 300 porters, and 34 donkeys and 5 ponies. What with attendants on the animals, our tent servants, and other odd men, the total of natives was over 360.

The donkeys gave us endless trouble. They broke down every few yards; they sat in every small rivulet; they tried to drown in every stream, and had to be hauled out by the ears and tail by main force, and when they had no other way of obstructing us, they died. What was a dry and parched and waterless district on my return journey, was now a series of streams running down from a low range of hills on our right, while the deeper clefts, also dry later in the year, were now rushing torrents, which delayed the donkeys for hours. On poor Mr. Mottram and Mr. Reynolds devolved the main task of superintending the donkeys —and it was a hard one indeed. It was necessary for me myself to arrive first, so as to select camp, see the local chiefs, arrange about food, and a score of other matters.

We started always as soon after daylight as possible, and while we had the donkeys with us, I don't think we ever did a full day's march much before sunset. On one occasion, indeed, I remember returning to relieve the others when my urgent camp-work was done, and bringing in the last of the caravan a little before midnight. The African donkey, either in East or in West Africa, cannot travel in the rains. Wet has the same effect upon him as it has on brown paper—it wholly unfits him to fulfil the objects for which he was made. But it was necessary to push on, for a French expedition was bound for the same destination as ourselves, and whoever arrived first would succeed, and the other would not. Indeed, on my return, I found that there had been some four different French expeditions and one German one; and the French papers spoke of it as "a veritable steeple-chase." But, then, the French have such imaginations! Had the editor changed places for a day with Mr. Mottram and the donkeys, he would have modified his metaphors.

We took a circuitous course, making a *détour* to the south, for there was no way of cutting across country when the grass stood in a solid 6-foot wall backed by a range of mountains. It was tantalizing beyond measure to find one's self going due south when one wished to go due north; but the delay enabled me to get a most excellent letter of introduction from the Emin of Illorin (to whom I had sent civil messages), and to get my men to some extent in hand before we entered the dangerous country of Borgu.

So far not much time had been lost. We had arrived at Akassa from Liverpool late on August 28; by September 9 we were at Jebba, 550 miles up-river; and on the 27th we marched, with the 200-mile trip to Bussa accomplished, and all the many final details of the expedition finished. Passing through a long stretch of sparse and uninhabited jungle, through which none dare travel for fear of the Borgu raiders, we reached Kishi, on the northern frontier of Yoruba-land. Here a treaty was made with the local chief, and we experienced the very greatest civility from these industrious and delightful people, who, however, live in daily dread of their lives from the incursions of the Borgu who raid all round their town.

RETURNING FROM MARKET.

(*From a photograph by Dr. W. H. Crosse.*)

The country of Borgu is, roughly speaking, included between the twelfth and ninth parallels of latitude, and the first and fourth meridians of east longitude, comprising approximately an area of 40,000 square miles, viz. more than half the area of England and Wales. Its importance politically lies in the fact that it is the Hinterland of the British colony and Protectorate of Lagos (*i.e.* Yoruba), of the French colony of

Dahomey, and part of German Togo-land, and that it borders the Niger river, the south-eastern portion reaching to the lower navigable river. Commercially, its value is not at present great, since the free-booting propensities of its people have not only rendered the export produce of the country insignificant, but have closed the trade routes, and to a great extent prevented traders from passing through the country. Its chief commercial value lies in its geographical position, midway between the trade centres of Salaga and Yendi in the west, and of Kano and Nupe in the east—centres which have been connected from time immemorial. The markets of Moshi and Gurma in the north are similarly separated from their outlet to the coast by the country of Borgu, so that if once the plundering bands can be checked, and safety to life and property ensured, the trade in transit through Borgu may become of considerable commercial importance, and even the products of the country itself—a valuable indigo, exceptionally good tobacco, cotton, and various drugs and gums—will undoubtedly grow in volume and importance. Geographically, the country does not present any features of marked interest. It is an undulating country, with few and small hills, and no large rivers. The watershed is towards the Niger, which forms its eastern boundary, and the most important rivers are the Moshi (which in the last 50 miles or so forms the southern frontier of Borgu) and the Ori, which rises near the capital, Nikki, and reaches the Niger in Bussa's territory. In the extreme west the watershed would appear to be towards the Volta. Geologically the country is extremely uninteresting. Masses of grey granite alternate, or appear simultaneously with the copper-coloured, honeycomb lava which forms the prevailing feature of West Africa as it does of the greater part of British East Africa. This "iron-stone" derives its colour from the very great percentage of iron which it contains. It is smelted by the Yorubas, the Nupes, and most of the other industrial tribes of this part of Africa, who obtain from it great quantities of metal. This (as in the case of the iron-smelting tribes around Ruwenzori) they make into hoes, which become a form of currency. The hoes are locally turned into spears, axes, arrowheads, etc., according to the requirements of the purchasers.

It is, perhaps, from an historical and ethnological point of view that Borgu, or "Bariba," is most interesting. The latter is the name almost invariably used on the spot to describe both the people and the country. Borgu, I believe, merely means "the grazing or grass lands," and has been applied to more than one district in Africa. Much confusion in geographical nomenclature has resulted from travellers having adopted these descriptive titles as the proper names of places or objects. Thus, Niam-Niam, Yam-Yam, etc., signifies, I believe, "cannibals;" Nyanza, Nyanja, Nyassa, etc., merely means "water," and is applied equally to lakes and rivers, as is the similar title Bweru, Dweru, etc.; while Mwuta

'Nzige is a spurious Swahili name which has been given to more than one lake, and means only "impassable to flights of locusts." Much interest, however, attaches to the real name of the people, "Bariba," for it would appear to connect this tribe with the great southern migration which is supposed by some to have taken place from the Barbary States; one location of these migrating tribes was probably in the district near Lake Chad, now known as Bornu, for there too the name of Bari-bari appears locally. Many of the Borgu towns bear this name, which is obviously a traditional one. Time does not permit me to trace the most interesting successive migrations of various tribes which have established the ethnological characteristics which distinguish this part of Africa to-day. Dr. Barth, and more recently the distinguished French traveller Captain Binger, are a mine of information on these subjects.

HAUSA TRADERS.
(From a photograph by Dr. W. H. Crosse.)

It will be sufficient to merely allude to the great southern movement of the Fulas (or Fellatas), who belonged apparently to the Ethiopic (Abyssinian) stock, whose ultimate origin was most probably Asiatic. It is from this stock that the pastoral tribes of East Africa are descended—nomad cattle-owners ever ready to fight in defence of their flocks and herds, who conquered all the Bantu negroid tribes whom they met in their onward march in search of pastures new. Distinguished from the negroid tribes alike by their thin and wiry physique, their aristocratic profiles, and their wavy hair (which formed a marked contrast to the heavy massive build, the flat noses and prognathous type of face, and the woolly scalp covering of the negroids), their descendants of to-day, the Somalis, Gallas, Abyssinians, Wahuma, and perhaps Masai in East Africa, and the Fulas of West Africa, still show all the characteristics of a conquering race. In West Africa they founded the Sokoto empire, whose dependencies include the great provinces of Yola, Nupe, Ilorin, and Gando. Further to the west, in what is now the French colony of Senegal, they met with one of the finest of the negroid tribes, as in the parallel case of Uganda. From the admixture of the two have sprung the stock which founded the kingdoms of Ahmadou and Samory, whose Sofa armies have maintained for twenty years a singularly courageous though unequal conflict with the arms of France, and still to-day remain unconquered.

One comparatively small country alone stood out against this tide of Fula conquest. The advancing wave of nomad warriors dashed itself in vain against the bulwark of resistance offered by the unconquered Baribas of Borgu, till, spent with the useless struggle, it turned aside to expend its energy on the subjugation of the countries which surrounded Borgu on all sides. Later on in the chapter of African history a new foe arose. Behanzin of Dahomey, with his Amazon warriors, and his contemptuous disregard for human life, spread the terror of his name in letters of blood. Armed with muskets, his woman-warriors carried carnage and victory far and wide, till the name of Dahomey was as that of "hell let loose." But Amazons fared no better than Felatas, and Borgu, though fronting Dahomey all along its southern frontier, remained unconquered. Nor yet, as I have already said, had any European succeeded in penetrating to Nikki, the fetish capital of this strange people. Duncan and Wolf had alone passed through the middle of the country; neither of them ever came back. It was, therefore, a singular piece of good fortune that it should fall to my lot to break through this barrier of exclusion, and, as the first European who had set foot in Nikki, that I should be the precursor of the French and German expeditions which immediately followed me.

After leaving Kishi, we again passed through a long stretch of uninhabited jungle, into which men came in fear and trembling even to cut firewood—for the name of the Baribas is a terror in the land—and arrived at the first large Borgu village, where lived the chief of Kiama. Whatever may have been his original designs, Kiama and I became real friends. I was greatly struck with his fearless bearing and aristocratic carriage. He visited my camp alone and unarmed by night, and on more than one occasion I reciprocated his confidence by a midnight visit for a friendly and uninterrupted chat. Such a meeting occurred the night before I left, when he warned me that he had positive information that a robber chief with 600 warriors had planned to attack us by an ambush near one of the swollen streams we had to cross. He implored me to consider whether I was strong enough to go forward. Should I decide to do so, he heartily wished me success and victory; but if I judged it best to return, he would see me safely out of Borgu. At the same time, with every evidence of sincerity, he warned me never to trust myself alone and unarmed at night in a Borgu village as I was now doing, for above all things the Borgu were a treacherous people, and no other chief would resist as he had done the temptation which such an opportunity offered.

I wish I had time to tell you more of this chief, for whom I had conceived a real liking, and of our life during our week's stay in Kiama. We made a treaty together, and, as in the case of every treaty I have ever made in Africa, every single clause was elaborately paraphrased and translated and explained to the utmost of my ability. I have absolute confidence that nothing would induce that Borgu chieftain to swerve from his part of the compact.

On October 25 we left Kiama in the usual deluge of rain, and our progress was made very difficult by the continual streams which had to be crossed. Fortunately there were no big rivers, and one stream only had to be bridged, though others were up to and above the men's necks.

The expected attack was postponed, probably, I think, because our intending plunderers deemed it a certainty that the king of Nikki would forbid our advance as soon as we came within hail of his town, and we should then either have to fight our way forward, or retire with all the obstacles we had crossed to be surmounted once more. In either case the marauders would have more ample leisure to choose time and place for their purpose, and would not run any risk of incurring the displeasure of the king of Nikki by executing their design; in fact, a strong contingent from thence would assuredly be available to assist in it. Accordingly, I received a message when yet some two or three days' march from Nikki, directing me to come no further. The king's chief fetish-man, I heard, had foretold that if Europeans came to Nikki, the king would die within three months of setting eyes upon them. The medicine-man was supported by a very strong party, who were determined to prevent the approach of Europeans. To this message I sent back a reply couched in terms which I judged would most appeal to the character of a Bariba chief. I came, I said, simply as a friend, with letters of introduction from friends. All the reports which had preceded me could only have been in one sense, viz. that no smallest quarrel had ever taken place between my party and the people of any village I had passed. Every ear of corn had been fairly paid for. Africa was large, I added, and many attractive districts lay both to the north and the south. If he wished none of us, it mattered nought to us; the loss was his, not ours, and we would travel in a more friendly and more hospitable country. We were solely a peaceful mission, though if we were attacked we would fight, and fight hard.

This assumption of indifference had just the effect I expected on the proud chief, backed as it was by messengers from Kiama and from the town at which I was halted, who urged that no other chief had died because of our advent, and begged the king to receive so friendly a traveller. So we received a message of welcome and invitation, and on November 5 arrived at Nikki. Here fresh difficulties awaited us. The king demanded the present he had been accustomed to receive from Hausa traders in return for permission to visit the town. I refused, saying I was no trader and would pay no blackmail; I came at his own invitation and as his guest. When he sent me the customary small present of welcome—the "gift of water," as it is expressively styled—then, and not till then, would I send my return present.

Matters remained critical for two or three days, and no present of water arrived. But meanwhile I had made a friend in need, and he proved himself a friend indeed. This was the "lemam," or Mohammedan missionary, who resided in this pagan town, and had much influence in the councils. Through his unwearied efforts all turned out well, and the king, whose extreme age had rendered him blind and very infirm, deputed some three or four of the leading men—including my firm friend, the lemam—to negotiate the treaty. This was done in a most intelligent way; each clause was discussed in all its bearings, and questions of a shrewd and practical nature were asked. Then, before leaving, I sent the handsome present of which I was the bearer. The king was delighted, and gave me letters ordering every one to place the whole of their resources at our disposal; to help us forward by all means in their power wherever we might wish to go, for we were now friends allied by a serious and important compact, and all Borgu was henceforth open to the British. All promised well, but I had already learnt that the chiefs of the country have no control whatever over the large lawless bands of highway robbers who plunder the caravans and render the trade-routes unsafe. It is the old African story, so familiar to us in the case of the Matabele and the Masai—the older men and constituted chiefs friendly and peaceable, the young warriors eager for plunder and bloodshed.

The night before we left Nikki I again heard of the intended attack. The grass and "bush" were still dense and high and as yet unburnt, and the streams difficult to cross. At the third march out of Nikki the reports took definite form, but so rapidly had we marched that they had not, I have good reason to believe, been able to concentrate the full strength they had intended. The chief of the town was our friend, and did his utmost to prevent the attack, sending me at last a midnight message of warning when he found his efforts of no avail; but the lawless bands who had assembled were bent on loot, their cupidity was excited by the value of the presents we had produced from our bales, and they looked upon us as an easy prey, for our forty rifles escaped notice among the mile-long line of unarmed carriers.

Africans as a rule detest and dread night fighting; they also have a very great fear of dividing their forces, preferring always to fight *en masse*, and should their enemy succeed in separating them, it is almost always the precursor of defeat. I attribute the successes of the Borgu to two causes. First, their reputation for a knowledge of witchcraft and of deadly poisons, which renders their poisoned arrows very dreaded. Second, to their fighting tactics. So far from dreading to separate their forces, their custom, I am told, when they attack by day, is to make a feint of attack simultaneously on front and rear, reserving the bulk of their strength for a strong attack on the centre of a long caravan. This mode of attack by ambush would generally succeed in dividing their enemies' forces and inducing panic. They, however, love most to effect a night surprise.

Baffled in this latter attempt by the midnight warning I had received, they awaited us as we left camp next morning at daybreak, only to receive a very handsome thrashing. But it was harassing work. From daylight to dark the previous day I had marched in a really blazing African sun, for the rain had now ceased and the heat was very great; all night I was patrolling camp with the strain of anxiety and responsibility which the situation naturally produced, to be followed by a similar day of hard marching and work (with a fight and a wound by an arrow thrown in), with a fresh rumour of attack by night. And this continued. Our destination was the southern frontier of Borgu towards Yoruba and Dahomey, for I was anxious to verify the frontier in this direction, and to personally ascertain whether my treaties already concluded held good to the extreme limits of the country.

VILLAGE ON BANK OF NIGER.
(*From a photograph by Dr. W. H. Crosse.*)

We arrived at Ilesha on November 27, and were again received with every demonstration of hospitality. The local chief, who was, I understood, brother of the chief of Nikki, insisted strongly that he was entirely bound by the treaties I had already concluded. He and his chiefs were, moreover, thoroughly satisfied with their contents, and voluntarily requested that some evidence of the fact should be in their hands, which they could produce in case any other Europeans came; for they knew all about the national distinction between French and English, since their town was situated on the borders of British Yoruba and close to French Dahomey. They told me of the expedition which had proceeded into Borgu from French territory, and said it consisted of 1500 men.

Negotiations of all sorts are tantalizingly slow in Africa, and the usual week had elapsed before we were ready to resume our march. It had been my intention to proceed further to the west, but the last few days had developed a very grave situation. Looking back on the events of those months, it seems to me that the Borgu freebooters, taking no heed to the occasional rifleman whose presence was masked by so great a throng of unarmed porters, had concluded that a benign Providence had sent into their country a vast assortment of valuable goods which was theirs for the taking. Their previous rebuff only stimulated the desire for reprisals, and hope deferred whetted their appetite for plunder. Rumours, which hourly grew into certainties, reached me that from every side bands of the freebooters were collecting like vultures who scent a feast.

More than two-thirds of my men, harassed by the nightly rumours of attack, became panic-stricken, and refused to march onwards. But desertion meant certain death or slavery, and their dilemma was pitiable. "We are but poor unarmed porters," they said, "working for our daily food; we are no fighting men, nor were we enlisted or given arms to fight. It is death to go on." I felt keenly for them, but I hardened my heart, and replied that never yet had I been dictated to by those I was sent to command. They had enlisted for an expedition, and were bound to go where the leader took them. If there was danger, we shared it equally. If they deserted me, I would burn the loads as they stood, but I would carry out my decision whatever it might be.

There was, however, a still more awkward dilemma. I had asked for some further supplies of barter goods to be sent to meet me at this point. The caravan would come wholly ignorant of their danger, and whatever might happen to my expedition, there would be little doubt that the other would be annihilated. An onward march without these supplies must be greatly curtailed, and would result in but meagre results at best, while trebling the total cost. To wait was impossible, to return and meet the expected caravan equally unfeasible, for neither love nor money would induce the bulk of the men to return once they had reached a safe haven. The choice lay between an onward march with the onus of the fate of the other expedition on my shoulders, or a return to the Niger. After a night of sleepless thought, I decided on the latter. Our camp was full of spies watching to make sure which road we should take. Every road was equally in their power. Seventeen miles through dense bush without a village separated us from the friendly frontier town of Saki, in Yoruba, but this road was particularly open to ambush and attack. I procured guides to go in the opposite direction, and made such careful inquiries regarding that route as convinced the Borgu marauders that I had finally made up my mind as to my intentions.

The hostile bands started overnight to take up their posts for the ambush. But, as I have said, during the long hours of the night, while constantly on the alert to see that my sentries were awake, and that everything was ready for an emergency, I had come to the decision to march for Saki.

. We had started for the north-west, and disappeared in the thick bush, to the obvious delight of some on-lookers, when I gave the word to the guides to make a *détour* for the path which leads due south to Saki. Marching straight through the jungle in the required direction, we presently struck the path, and after a hard 17 or 18 mile march arrived close to Saki.

JEBBA ROCK.
(*From a photograph by Dr. W. H. Crosse.*)

The King of Ilesha had sent his grandson as our guide, and this young gentleman naïvely admitted, I was told, to my interpreter that his own retainers were amongst the crowd who had gone ahead to waylay and plunder us, and who had been so completely "sold." The treacherous young scoundrel would have played, of course, into the hands of his allies; but finding that the plan had been foiled, he made no concealment. The King of Saki also told us that he had heard of the matter, which apparently had been widely spread throughout the whole country, and that the combination against us was in overwhelming strength. His astonishment at our arrival safe and unscathed was very great.

It was extremely pleasant to be back in Yoruba. The really gentlemanly manners, the extreme courtesy and hospitality of these people, are more marked than I have ever seen elsewhere in Africa. At a distance from the town you are approaching, one of the highest chiefs deputed by the local king will meet you mounted on his war-horse, a diminutive pony smothered with quilted housings and *jujus*, or charms, to avert danger from horse or man. As the cavalcade approaches in its gorgeous trappings — for these Yorubas affect robes of costly cloth, velvet and damask, and caps of plush—the head of the deputation will dismount, and, with great gravity and precision as befits his years and his stiffening joints, will slowly proceed to lay himself completely flat on the ground and rub his venerable face in the dust, the while inquiring how you have fared on your journey, how you slept last night, and such other courteous phrases as may occur to him. He then conveys his king's greetings and welcome, and tells you of his delight at the honour conferred upon him by your visit. Painfully the old man rises, and all the other prostrate forms rise with him; his attendants hold his stirrup, and he mounts, and the cavalcade is reformed and leads the way. Having courteously asked your permission, leave is given to the escort which accompanies him, and presently volleys are heard from their ancient muskets, and a mimic warfare is carried on in celebration of the event of the day. To me there was a sense of incongruity in the obeisance of these courtly old savages, in their robes of snowy whiteness or of brilliant colours, before a dirty, tattered, and unimportant-looking individual like myself; but the contrast was a pleasant one after the amenities of Borgu.

The king of Saki was glad of the opportunity to enter into an alliance with the British, but he implored me not to proceed on my way until he could provide me with an adequate escort, for between his fortified town and those of middle Yoruba lay a stretch of uninhabited jungle, which was constantly occupied by large war-camps of the Borgu raiders, to the terror of the peaceful Yoruba traders. Not long before, he told me, a European had been on his way here from the south, to whom he had sent messengers imploring him to await an escort which should follow. The European — a Frenchman named M. Hess — pooh-poohed his friendly offers, with the result that the Borgu fell upon his caravan and dispersed and looted it, and the Frenchman himself was hit by a poisoned arrow and died. Saki feared that blame had been attached to him for this disaster, and deplored the possibility of a like catastrophe happening to us. Even here in our camp outside the walls of Saki, we were not safe from a night attack from these marauders, and the necessity for vigilance was as great as ever.

Dense fogs, amounting often to Scotch mists, made the work of looking after sentries, etc., by night a disagreeable task, and the stress of work by day and night at last induced a somewhat severe attack of fever, so that I was not sorry to prolong my stay for a couple of days, by which time the escort was ready. To my surprise, some four hundred armed men turned out, led by all the chiefs next in importance to the king, and even his own confidential slaves were included. This robbed the town, situated though it was in the midst of hostile bands, of its leaders and almost the entire fighting strength, though the king himself was seriously ill.

Africa has been talked of and written of from almost every point of view, but among its as yet unwritten chronicles there is many such an incident of disinterested generosity which travellers have forgotten to record. The description of Africa which we often hear, as a land of mere swamp and desert and malaria, is no more applicable to its often exquisite scenery, its mountains and salubrious uplands, its lakes and its forests, than the similarly loose description of its peoples as bloodthirsty savages and cannibals is applicable to such a tribe as the Yorubas. Here on this platform, some three years ago, it was my privilege and my pleasure to record more than one instance of heroism which I had seen in East Africa, and what I have just said will, I think, prove that generosity also is not an unknown virtue there.

We passed on through the large towns of Iseihin and Oyo to Ikirun; where I met Commissioner Bower, who was engaged at the time in negotiations with the Emir of Ilorin, regarding the adjustment of his frontier towards the Lagos protectorate. As Ilorin—an outlying province of the Sokoto empire—is under treaty with the Royal Niger Company, I offered my services to promote the solution of the difficulty in a friendly spirit, for some friction had arisen between the Emir and the British Commissioner. The result was that Captain Bower and myself proceeded on a joint delimitation of the Ilorin frontier, and spent a few very pleasant days together. When with very great regret (on my side, at all events) we parted when our task was done, I turned north with my expedition, and reached my starting-point at Jebba on January 12 last. Here we paid off and dismissed our men, to many of whom we had formed a considerable attachment. Numbers came to bid us farewell and declare their eagerness to follow us anywhere if we should return to travel elsewhere in Africa, and some few seemed to show a genuine sorrow at saying good-bye.

These porters consisted of three different tribes in almost equal proportions. Of the Nupes I have little to say in praise. They added almost daily to our difficulties by grumbling at their food, mutinying from fear, and by constant and hourly quarrels and fights. But the Yorubas and Hausas were of very different stuff. Of the former I have already spoken. As a race they are exceptional for their industry and their skill both in agriculture and in mechanical work. They have a passion for trading, and are extremely intelligent and fairly plucky. I regret to say that it is this fine race—one of the finest in West Africa—which is being demoralized by the importation of millions of gallons of the cheapest and most noxious of spirits from Hamburg and Liverpool.

This import strangles legitimate trade, and leaves the native worse off for his contact with British merchants. In return for the vast export of palm oil, together with rubber, capsicums, shea butter, indigo, and other produce, the Yoruba ought, after the lapse of so many years, to be in possession of abundance of cloth and useful European articles, instead of which he has as a rule only a heritage of empty gin-bottles and an enfeebled physique to hand down to his posterity.

The Hausas, though as a rule probably less intelligent than the Yorubas, are undoubtedly one of the most interesting of the races of Africa. They too are born traders, and conduct their own trade caravans for hundreds of miles from their head-quarters at Kano and Sokoto.' Their language has become the *lingua franca* of West and North-West Africa, from near the shores of the Mediterranean to the basin of the Congo. Hence it is a matter of the first importance that this language should be well understood by those who seek to enter into relations with the great Hausa-speaking tribes, whether it be for purposes of commerce and trade, or for missionary and philanthropic effort. Hausa is usually written with the Arabic alphabet, and having reached this point of development, it becomes feasible for Europe to create a Hausa literature, which may have a considerable effect on Mohammedan thought in the embryo literary centres of Kano and Sokoto, etc. The "Hausa Association" has done invaluable work in this connection, and I had the pleasure of meeting in Africa Mr. Robinson, the Hausa student, who has gone to the Sokoto territories to study the language under its auspices. The association have been fortunate in obtaining the services of a man who presents the rare combination of exceptional linguistic talent, a perfectly fearless traveller, and an iron resolution. He gave me a specimen of the kind of pamphlet which he proposed to distribute; I allude to the manner of writing, etc. It will be a new departure in the progress of Africa if the educated Moslems of the Central Sudan become dependent for their literature on English printing presses; but I trust that efforts may be made to substitute the Roman for the Arabic alphabet, by printing the Hausa text collaterally in both forms.

I had hoped to have been able to say a few words on many other subjects of great interest in West Africa, and to detail at greater length the customs, mode of life, buildings, weapons, arms, and utensils of the Borgu and Yoruba people, but I have already, I fear, trespassed too long on your patience. I would have liked also to have spoken of the marked points of contrast between the savage tribes of East Africa and the curious semi-civilization introduced by the Mohammedan religion, which has at least had the effect of welding into kingdoms and empires the populations of these countries; and of introducing to you Mr. Mottram —one of the two comrades who accompanied me on this little expedition, and to whom its success is largely due, but unfortunately he is laid up with an attack of African fever. I regret that Mr. Reynolds, the third in our party, is still in Africa. The untiring energy and loyalty of both these officers it is a pleasure to recall, and I need hardly say that from first to last it was these qualities in my comrades which made work a pleasure, and rendered even formal orders a thing, I think, wholly unknown between us.

Before the reading of the paper, the Chairman, Sir GEORGE TAUBMAN GOLDIE (Vice-President), said: As you know, it is our custom here that, when a paper is going to be read to the meeting, your President, or, failing him, a Vice-President, should make some prefatory remarks, introducing to the meeting the traveller who is to read the paper. In the present instance this procedure seems to me rather superfluous, because I feel sure that Captain Lugard is far better known to most of you than his introducer; but as I must not depart from our established practice, I will draw your attention to one point, which might perhaps otherwise be overlooked. I believe that to many people in this country the name of Lugard in connection with Africa summons up only an idea of Uganda, and that is very natural, inasmuch as the creation of that new province was so largely due to his energy, his courage, and his skill; but all of you who have followed the course of African events during the last ten years are aware that Captain Lugard's experiences in the Dark Continent have by no means been confined to what is generally called East Africa. So long ago as 1885, during the Suakin campaign, he had executive charge of the transport arrangements, which must have brought him into close contact with the natives; later on, in 1888 and 1889, happening to be in Nyasaland, which at that time was threatened by the Arab slave-traders, he initiated, organized, and led important expeditions against them, but for which I doubt if there would have been left there any European settlements to develop as they have since done into what is now known, I cannot tell why, as British Central Africa. I mention these facts, not by way of commendation of Captain Lugard—for, as you know, good wine needs no bush—but because at the moment he is about to read to us a paper on a recent visit to the western quarter of the continent, and it is well to remember that the value of the impressions he has brought back must be immensely augmented by his capacity to compare them with corresponding impressions gained in many other parts of the continent, in South Africa and North Africa, as well as East Africa; in fact, I cannot doubt that it is Captain Lugard's wide experience in Africa, and his services to civilization all over the continent, that have been the cause of his being honoured by her Majesty with the mark of distinction which I saw announced in this morning's paper.

After the reading of the paper, the following discussion took place:—

The CHAIRMAN: Before we return thanks to Captain Lugard for his delightful paper, it is customary to invite any gentlemen present to enter into discussion upon it, and I should like to be allowed to call upon one gentleman present, M. Dhanis, who is well known in connection with the Congo basin, and practically restored order in the Free State, and gave it security. I am perfectly aware that the Congo and Niger are not the same places, as some French newspapers evidently believe; but you must remember that the physical conditions are very much the same everywhere in tropical Africa, and I have no doubt that Baron Dhanis can give us some valuable remarks.

Baron DHANIS: I thank you very much for the kind notice you take of me, but I beg you will excuse me making any remarks on the very remarkable paper I have just heard from Captain Lugard. We all in Belgium have followed the work of Captain Lugard, and I am very happy to be present this evening to be able to applaud him also. I hope you will excuse my making any further remarks, as I am not accustomed to speak in English, and, besides, I am not at all prepared this evening.

Mr. RAVENSTEIN said that they must all feel delighted to have Captain Lugard once more among them. The excellent work done by him in East Africa had at last been recognized by the public, and he felt sure they were pleased that he had been equally successful in the region of the Niger. That river had eluded the grasp of the geographer for centuries, and although the old maps showed unmistakable indication of a big delta at the bottom of the Gulf of Guinea, theoretical geographers had connected the Niger with a big lake, or even with the Congo. It was, in fact, only during the present year that the entire course of the river had been found.

Captain Lugard, by crossing the routes of former explorers, had done excellent service, and, by combining his work with that of his predecessors, we were now able to construct a fairly accurate map of the country. A German expedition, starting from the Togo country, had met with equal success, further north, in Gurma. This race between British, French, and German explorers, the distribution of flags, and the signing of treaties, might cause diplomatic difficulties, but they, as geographers, had every reason to rejoice. He hoped that Captain Lugard would still be afforded many opportunities of distinguished service as a geographical explorer, and of serving his country in the true interests of humanity.

Dr. CROSSE: When I heard that I was to have the honour of being asked to speak to such a distinguished audience, I felt extremely nervous, and inclined to decline the honour. However, I feel I must not lose this opportunity of telling you what I can of the Niger territory. I went out when the charter was granted to the Company, and where, in 1886, there was suspicion of the European, there is now confidence; where intertribal warfare used to be the rule, it is the exception; where human sacrifices were so enormous in number that often, in my own small village, Asaba, 150 miles up the river, no less than 1000 to 1200 people were killed every year for sacrifices, to-day there is not one person killed. This is one result of the charter administered by the Royal Niger Company, as represented by our worthy chairman, Sir George Goldie.

The CHAIRMAN: I now rise to propose a hearty vote of thanks to Captain Lugard for his most delightful address. A letter was received to-day from Colonel Monteil, stating that, owing to the late debate in the French Chamber, he very much regretted he was unable to be present to hear Captain Lugard's paper. I also have to tell you that two or three days ago a very remarkable confirmation arrived in England of the statement I heard Captain Lugard make as to his friendship with the King of Kiama. A few days ago a letter arrived from that king, marked very urgent, in which he informs the Niger Company that since Captain Lugard had left, the French had come upon him with force, and he hoped Captain Lugard would support him. I only mention that to show that Captain Lugard was justified in referring to the amiable manner in which the King of Kiama received him and parted from him. I have now only to ask you to join in a vote of thanks to Captain Lugard, which I know will be unanimous.

Captain Lugard thanked the meeting.

The CHAIRMAN: There are some very excellent maps of Captain Lugard's in the next room, showing the routes he worked out during this journey. They came out within one per cent., although based on paces only—a remarkable result.

NOTE.—A few photographs of Borgu by Mr. Mottram, and of various parts of the Niger by Dr. Crosse—who for some nine years has been the senior medical officer in the Niger Company's service, and has shown a devotion to his work which is the theme of every one who has ever visited the Territories—were shown on the screen.

NOTES ON WESTERN MADAGASCAR AND THE ANTINOSI COUNTRY.*

By J. T. LAST.

IN this paper I wish to put on record some of the chief points of interest connected with my journeys and explorations along the west coast of Madagascar, and also some account of the south-central districts, inhabited by the Antinosi immigrants from the country near Fort Dauphin, on the south-east coast. The primary object of my expedition was to make collections of Lepidoptera, to which I added that of collecting other objects of natural history, and of obtaining general information about the country, people, and places as circumstances permitted.

Sometime previous to my visit to Madagascar I had been engaged in similar pursuits in East Africa. Leaving East Africa, I went by mail to Zanzibar, where I made a few collections in natural history, and also preparations for a lengthened stay in Madagascar.

On July 2, 1889, I embarked, with a party of six Zanzibar men, on board the French mail steamer *Amazone*. In three days we had reached the rocky mountain mass of Mayotte, one of the Comoro islands, and on the next day we dropped anchor at Nosi-bé. The island of Nosi-bé is situated off the north-west coast of Madagascar, a few miles from the mainland, in about long. 46° 15′ E. and lat. 13° 20′ S. It is some 15 miles long between north and south points, and about 10 miles in extreme width, and forms part of the eastern side of Pásindáva Bay. The extinct craters show the volcanic nature of the island. Of these there are several, some in perfect form, especially one a little to the north of the town of Hellville; the cup-like sides of this is covered with a thick forest, and there is a deep lake at the bottom. In the south part of the island rises the high mountain mass of Luku-bé. This is covered with a fine forest of magnificent trees, palms, bamboos, and other growths. The soil of the island is fairly good, and sugar-cane has been largely cultivated for the manufacture of sugar and rum; but, owing to the heavy taxes and the difficulties of getting labour, many of the proprietors find it most difficult to make their business a paying concern. The island was formerly in the hands of the Sakalava tribe of Malagasy, who, to avoid falling into the hands of the Hovas, sought the help of the French at Bourbon, and in 1840, placed themselves and their country in their hands. The next year the French took formal possession of Nosi-bé, and have held it ever since.

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* Maps, p. 300. The coast-line has been taken from the latest Admiralty chart.

Hellville, the chief town in Nosi-bé, and the seat of the French government in the district, is built on a point on the south side of the island. The main street is occupied by the official buildings and a few shops. The rest of the town is occupied by a mixed population of various Malagasy tribes—Betsimisarana, Sakalava, Hova, and others; with these there are also a number of Makuas from Africa, Swahilis from Zanzibar, and Antilotis from the Comoro islands. The government buildings and principal houses of the town are built of stone, some few of boards; the others are all of light material, chiefly the leaf stalks and fronds of the various palms which grow about the country. These latter buildings are very inflammable, and it is no uncommon thing to see the whole or greater part of a town destroyed in one blaze.

The rather important town of Máradúka (many markets) lies in a small bay a little to the south-east of Hellville. This place is inhabited almost entirely by Hindi traders, Makuas, and other Swahili-speaking people. It is a very dirty hole, but a considerable amount of business is done here, with the people of the mainland, in hides, rubber, ebony, and other things.

Nosi-bé can scarcely be considered a healthy place, especially about Hellville, where the back part of the town is built on the banks of a wide, steaming, muddy creek. The French have built here a strong pier and landing-place, and extensive coal-sheds for the use of their men-of-war, which are frequently here; and also the mail steamers of the Messageries Maritimes, which call here every month.

I was engaged for about two months collecting in Nosi-bé and the adjacent islands of Ambári-vátu and Táni-kéli. Ambári-vátu is a conical-shaped hill of about 2000 feet high, rising out of Pásindáva Bay, a short distance to the south of Nosi-bé. It is well wooded all over, but very rocky, quite unsuitable for cultivating anything. There are a few small Sakalava villages near the beach, but the natives depend more on their fishing to supply their wants than on anything they can grow. Lately the crown of the hill has been cleared, and the French governor of Nosi-bé has built there a kind of country house and sanatorium.

Táni-kéli is a much smaller and less elevated island nearly in the middle of Pásindáva Bay. It is of undoubted volcanic formation, and its beautiful vegetation of palms, ferns, orchids, and other plants, are well worthy of a visit from any botanist who may happen to be in the neighbourhood. At the west end of the island there is a large colony of bats, a species of pteropus or fox bat. These all hang sleeping during the day; as the evening comes on they all stream off to the adjacent country in search of food. The morning finds them all back again at the same trees; nor, even if they are disturbed, do they quickly forsake their old haunts and seek fresh ones.

It was now time that I should begin to explore and collect about on the mainland; but before doing so it was necessary I should go to Anórontsánga and see the governor-general Rakotovau, and obtain from him letters of introduction or passes to all the subordinate governors and officers in his district. This is a large tract of country extending from the river Andránu-bé a little to the south-west of Nosi-bé, to the river Máivaránu, in about lat. 14° 35′ S. This includes more than 100 miles of coast, and inland there is no definite boundary. The whole of the district, excepting some few flat places near the coast, is exceedingly hilly, and in some parts lofty mountains raise their heads to a height of 6000 or 7000 feet. It was my wish to visit as much as possible of this district, and to do this it was necessary that I should have at least the good-will of the Hovas, even if I did not get any actual help from them. To secure this it was necessary I should see Rakotovau, the governor-general at Anórontsánga.

Anórontsánga occupies an important situation in Rafála Bay, at a distance of some 45 miles or more to the south-west of Nosi-bé. It can be reached from Nosi-bé by two routes—one by boat or canoe to Ambúdimadíru, a town at the south extremity of Pásindáva Bay, and the rest of the journey overland; the other way is to go either by large canoe or boat all the distance by water, steering across Pásindáva Bay to Vávatúbe and Kivínji Rock, and then down the coast to Rafála Bay. I decided to go all the way by water, and hired a boat for that purpose. The journey generally takes two days, but, owing to bad winds, the first day's sail took us to a village, Márakúhu, on the west side of Pásindáva Bay, and there we had to anchor. The wind was dead against us. We went ashore, and were made welcome by the natives, who are chiefly Sakalavas, a few Makuas and Antiloti people living with them. A Sakalava queen, Benu, ruled over this district and surrounding country at the time of my visit, but since then it has been acquired by the Hovas, without fighting, but by a little stratagem on the part of Rakotovau. I was told that he, travelling with a large party of men and attendants, professed that he was on a kind of state visit to Queen Benu. Suddenly appearing on the high land above the queen's village, he demanded submission on the part of herself and all her people, or he would blow the place to pieces. He had made a kind of wooden cannon out of a log of wood, and with it so terrified the Sakalavas that they submitted without a shot being fired.

Leaving Márakúhu the next morning, we managed to reach Vávatúbe, and had to anchor. The following morning we had a fine, fair breeze, and quickly rounded Kivínji Rock, passing the islands of Bérávi and Ránza; thence a fine sail along the coast, and we reached Anórontsánga about three o'clock in the afternoon. This is the most important Hova town on the west coast, between Cape Amber, on Búbaómbe, and Mujangá. Anórontsánga is really two towns, the coast town inhabited chiefly by Sakalavas, Makuas, and Swahili-speaking people, with a few Hovas.

Here there is a meat market, a few Hindi stores, Hova rum-shops, and a building used as a church and school. The other part, or town, is a mile or more inland, on the top of a high hill. Here is the residence of the governor-general and other officials, and the place is inhabited exclusively by Hovas. There is a large building used as a school and church, also the usual number of rum-shops and petty-dealers' places.

My first business on landing was to hire a small house, as I intended to remain some few days in the place. After I had done this, and put things in order, I sent a notice of my arrival to the governor-general, and at the appointed time went up to pay the customary visit. Introduced by a Norwegian gentleman, Mr. N. O. Handerwick, who has been many years in the country, and is a personal friend of the governor-general's, I was well received by the Hovas; and when I had stated the object of my visit to the place, the governor-general promised to give me all the necessary passes, and whatever assistance lay in his power.

After the formal part of the visit was over, the governor-general invited us to his private room to take some refreshment, and by his pleasant conversation and questions showed that he took a great interest in the affairs of other nations, and also in my work of collecting. He could hardly understand why people should spend their money and time in simply collecting a few insects and birds.

After this we retired, and shortly after we reached our house, the usual present of food was sent down by the governor. It is the custom, and by order of the queen, that all European strangers, arriving at any Hova station, shall be given a present of food, as soon as they make their presence known. It generally consists of rice, fowls, ducks and eggs. Rakotovau was especially liberal to us, sending us joints of beef as well as the usual present.

The next day Mr. Handerwick and I went by invitation to meet the governor-general and his officers at dinner in the Ruva. The "Ruva" is the fortified residence of the governor. We were most kindly received, and after dinner the governor gave me the passes and letters he had promised me on the previous day, adding that if I should require other passes, or help in any other way, it would be his pleasure to assist as far as he was able.

Judging from my knowledge of him during nearly five years' residence in Madagascar, I have every reason to believe he acted fully up to his promises, and it is with the greatest pleasure I bear testimony to the high character of Rakotovau, 14^{vtr}, D.P.M., Governor-General of Anórontsánga and its dependencies. In all my dealings with him, I found him to be a good man and honest; of the strictest integrity, a lover of justice, ever ready to assist any foreigner, whether trader or traveller, who will be honest with him, and yet he never forgets his position or duty to his own state and country.

After the introductory visits to the governor, I remained several days collecting in the coconut plantations and surrounding country, not so much for the collections, but rather that the governor and I might become better acquainted with each other. This was accomplished by an interchange of visits, and a friendship was formed which I continue to value.

Having secured the necessary papers and means, I began a series of journeys to the more distant parts of the district, governed by Rakotovau. The space at my disposal will not allow me to give a detailed account of each of these journeys; I can only here refer to the more important points of interest connected with the country and people.

The three chief journeys I made were—one to the headwaters of the Sámbiránu river; the second took me to the sources of the Manúnguárivu river; and the third, from Andránumaláza through the Ambalíha forest to Békulúsi Hill, which I ascended, and then to Anórontsánga by way of Ankarámi. The Sámbiránu river takes its rise among the mountains some 60 miles inland, a little to the south-east of the longitude of Nosi-bé, and empties itself into the sea near the south end of Pásindáva Bay. Excepting the rather extensive tract of flat country near the coast, the whole of the country through which the Sámbiránu and its tributaries flow is very hilly, and in some parts quite mountainous. The part of the river near the coast is very wide, and, during the dry season, shallow, so that then only boats of a light draught and canoes can be used on it; but during the rains the river is flooded, and boats of 5 or 6 feet draught can be taken a long way up. The principal tributaries of the Sámbiránu are the Ruáména on the right bank, and the Mánambúru and Mbáhatra on the left. These are fed by many considerable affluents, which receive all the streams and torrents from the neighbouring mountains.

The whole of the country drained by the Sámbiránu is very fertile. The lowland near the coast is one large garden, where Indian corn, millet, beans, semsem, potatoes, cassava, and pumpkins are produced in abundance. Of fruit trees every village has its mangoes, guavas, bananas, and others; while fine pine-apples are raised in the garden or near the house. Inland, along the watercourses, and on the mountain slopes, the soil is most productive, and it is one of the most prolific as well as the most extensive rice-growing districts in North Madagascar. During the dry season the minor branches of this river are very shallow, so that their beds are often used as roads between distant villages. Generally there is a path alongside the stream, but people prefer to walk in the watercourse, especially if the pathway in the forest is damp, because of the troublesome leeches. These are most voracious and rapid in attack. The native, who invariably goes about with bare legs and feet, is especially subject to their attacks, and therefore prefers to travel by the river-bed. When obliged to pass through a piece of forest where these pests exist, he arms himself with a piece of moistened tobacco tied in some rag to the end of a stick. Leeches have a great dislike to tobacco, and a slight touch from the tobacco-stick causes them to drop at once; otherwise they are somewhat difficult to remove until they are quite gorged, and then they drop off. The native would not attempt to pull it off; but if he had not any tobacco, he would give the leech a sharp slap, and then it would fall off.

In the Sámbiránu and all its tributaries, crocodiles abound, especially in the Rúaména; there are also several species of fish in good numbers. The natives catch these in large baskets, but do not seem to know how to use the rod and line.

Up the Rúaména branch, about five miles from its junction with the Sámbiránu, there are four or more very hot springs of water. Two of these rise from among the rocks on the right bank of the river, and make a deposit of a kind of salt all around. This is not eaten by the natives, but they drink the water as a remedy for certain diseases, and the country doctors highly recommend its use. In the middle of the bed of the river there is a huge heap of rocky boulders piled together, and here again there are some more hot-water springs. This place is held sacred by the natives, who have adorned the rocks with poles and flags of red and white cloth. They cannot account for the fact that the springs of water are hot, so they feel there must be something supernatural about the place, and therefore it is a fit and proper place for them to present their offerings and make their prayers. There seems to be a line of these hot springs, which extend from the right bank of the Rúaména, across the country, in a westerly direction to the left bank of the Sámbiránu, where there are a number of small springs of very hot water, and the ground all around is covered with a kind of salt.

The whole of this hilly district was once covered with a dense forest. A great part of this, especially alongside the watercourses, has been cleared away, and the ground utilized as rice-gardens. Every year new tracts are felled and burnt, and new gardens made. In time, the hills will be quite denuded of forest, and the result will be a dry and barren country.

I remained in this district of the Sámbiránu some three months, making various collections. During this time I travelled about from village to village, and was always received with the greatest kindness by the natives; and I ever found them ready to help me, by supplying guides and in other ways. Food was always plentiful. A hungry stranger would never need to leave a village; he would at all times be welcome to such as the natives had, or, if he preferred to buy, he could do so at a reasonable price. In travelling, I passed but few villages without being given something—a bowl of rice, or a fowl, or both; and whenever I slept in a village, the customary gift of food was always presented.

When I had finished my work on the Sámbiránu I went to Nosi-bé, and shipped my collections home. After a few days' rest, I again proceeded to the mainland to resume my work.

The Manúnguárivu river rises in the lofty group of mountains lying south-east of Ankarámi. This town is situated one day's march inland from Ambúdimadíru, or two days' march in easy stages from Anórontsánga. Both roads are very rough; that from Ambúdimadíru especially so. It is seldom one has such a succession of deep valleys to cross or steep ascents to climb. The whole country along the line of march is very hilly, and covered with a thick forest. Here and there a Sakalava village is seen, partly hidden away in some valley, and others crowning some hilltop. Around these the forest has been cleared away for a considerable distance. Here the natives make their small gardens of potatoes, cassava, and a few other vegetables. The rice-grounds are generally some little distance from the village. Streams and mountain torrents flow in all directions, and lend themselves easily to the work of irrigation, which is necessary for the drier parts of the country.

The Anórontsánga road, though rough, leads over a more open country; it is less hilly and less thickly wooded; there are more villages and much more country cultivated. Three or four considerable streams are passed on the route, and at one of these, attached to the rocks in its bed, I found some splendid oysters of a large size. There are three kinds of oysters about the sea-coast and in some of the rivers of north-west Madagascar. The small oyster, which at low water may frequently be seen in great numbers; there is a kind of pearl oyster, which is only found at a distance from the beach and in somewhat deep water; the third is a still larger kind, only found attached to the rocks in fresh-water rivers—the inside of the shell is much darker than that of the pearl oyster found in the salt water. Leaving Ankárami, we passed round the western foot of a lofty mass of hills, and in two hours reached the Manúnguárivu river. On both banks there are a number of villages and extensive gardens. Here we rested for a while, and then proceeding further up the river, camped in a village on the left bank, and made it our head-quarters whilst in the district. The chief of the village, a Betsimisaraka, was very kind, and insisted on my using his house, the best in the village, until I had finished collecting in the neighbourhood.

During the two months I spent in this district I examined almost every stream and rivulet forming the headwaters of the Manúnguárivu. The two main branches each drain an enormous crater-like basin. That on the right bank is formed of hills some 3000 feet or more high, and encloses a cup-like hollow quite three miles in diameter. Its sides are well wooded, and numerous streams descend from all parts, to meet at the bottom, where they form a considerable river, which flows out through a large gap on the south-west side of the hollow, and runs on to the Manúnguárivu. In this huge hollow there are several villages inhabited by Sakalavas, who have cleared away large tracts of forest, on which they raise rice in abundance and sugar-cane grows luxuriantly.

The principal affluent on the left bank is fed by streams which meet together in a much larger crater-like formation than that just described. The mountain-sides rise to a height of some 6000 feet or more, and they enclose a hollow of from 10 to 12 miles in diameter. There is a large break on the north-east side by which the waters escape, and, flowing round to the north-west, enter the Manúnguárivu. The whole of the basin and the mountains on all sides are covered with a densely thick forest of fine trees, rubber-vines, and other creepers, bamboos, palms, and undergrowths. This extensive hollow is uninhabited except by the wild boar-fusa (*Cryptoprocta ferox*), several species of lemuroids, and some smaller forms of animal life. The natives prefer to live along the banks of the river, where they have a much more open country, especially lower down and outside the mountain mass, where there are large tracts of flat country well adapted to the cultivation of both rice and sugar-cane. This latter article is in great demand with the natives, who use it extensively in the manufacture of rum as well as a common article of food. After leaving the mountains, the Manúnguárivu flows in a south-west direction, joins with the Andránumaláza and empties itself into Radáma Bay. Excepting in the wet season the river is very shallow, and can only be navigated by canoes and boats of very light draught.

When I left this district I went by road to Anórontsánga. The French mail steamers used to call at this place in those days, so I was able to ship my collections home. Afterwards I undertook another journey from Anórontsánga to Andránumaláza, and thence through the Ambalíka forest to Békulúsi, and back to Anórontsánga by way of Ankarámi and Bézávuna. We went in a hired boat from Anórontsánga to Andránumaláza. We had hoped to reach the place in one day, but soon after entering Radáma Bay we stuck on a mudbank, and as the tide was running out, we had to remain there till it rose again. I need hardly describe the discomforts of such a position; any one who has been unfortunate enough to have to spend an evening in or near a mangrove swamp swarming with mosquitoes, can form some idea of our situation. The next morning we reached Andránumaláza, presented our passes and proceeded on our way. This took us to the left bank of the Manúnguárivu river, and towards evening we camped just under the south side of a remarkable hill, named Anguruni. This is an isolated mass, and in the distance has the appearance of a huge building raised in terraces. The next morning we went on. After passing through some forest we came to the villages of Anúnuláva. We rested here for some time, and then followed a path which took us over a rough forest country, and after descending a narrow precipitous spur of the hills, we arrived in the Ambalíha valley. Villages are scattered all about the valley, and a good-sized river passes through its length, and goes on to join the Andránumaláza. River, valley, and villages all take the name of Ambalíha from the fact that "valiha" (bamboos) are the most prominent feature in the vegetation round about.

The villages are inhabited entirely by Sakalavas, who were very civil to us, giving us the information we wanted and some sugar-cane into the bargain. As we proceeded up the valley, we came to a village quite deserted. The people were all away in their distant plantations, and would not return for a month or more. We camped here for the night, and the next morning resumed our march, following the path which took us over the hills, till we came to a large tract of cleared ground land and two villages. From this place we could find no trace of a path going east. The natives insisted that they did not know of any; but I doubted them, and I doubt them still, though I did not find any. There was nothing left for us to do but to get through the forest as best we could; we had no thought of going back. Our course lay east, and the peak of Békulúsi in the distance was a good point to work to. So off we started.

It took us three days to get clear of the forest, until we came out at the villages on the left bank of the Manúnguárivu. It was a terribly difficult and rough piece of travelling, more especially so because our way took us over a mass of hills, all up and down, not a piece of level country anywhere. In some parts we found the ground covered with a kind of rattan-cane, which was most difficult to get over. We crossed several considerable streams as we went along, all trending along to the Manúnguárivu. The scenery is grand in some of the valleys—lofty rocky precipices, a dense forest on either side, the banks of the stream lined with graceful palms and strange ferns, the stream rushing and tumbling over the rocks, making a thousand cascades and bright little waterfalls. After three days we cut our way out of the forest, and after passing through a number of villages and gardens, arrived at the town of an old Betsimisaraka friend, and there camped.

At the back of this town rises the lofty hill of Békulúsi, one of the highest in North Madagascar. According to native report, no European had ascended it till I did so. I took with me three men, and thought I should be able to reach the top by evening; but the way was too rough and the forest too thick for that, and we did not arrive at the summit till late the next morning. The whole mountain is thickly wooded; as we go up the large trees gradually disappear, and palms, pandanus, and new varieties of ferns are seen. On and about the top, the ground and all the bushy vegetation is covered with a light kind of moss; in some places it is quite 18 inches deep. Here there are no large trees, only a few scraggy bushes and heath-like plants.

After finishing my observations we descended again, and reached the camp about noon of the third day. Some few weeks were spent making various collections, and then we went over the mountains to Ankarámi, and on to Anórontsánga by way of Bézávuna.

I remained some few days in Anórontsánga, and then hired a boat to take me slowly down the coast, my object being to collect as I went along, and then, making Mujangá my head-quarters for a time, to continue my operations in the surrounding country.

After bidding farewell to our friends at Anórontsánga, we went on board, and, taking a south-west course, a good stiff breeze soon brought us under Nósi Úvi, and after passing between Nósi Fáli and Nósi Mbalíha, we took a more southerly course, and touched the coast at Andránumbélu, where there are a number of Sakalava villages. We went ashore, and after a little negotiating were given a house to make use of. Throughout the night there was a great deal of noise—shouting, singing, and dancing. The sister of a Sakalava queen living in an adjoining village was very ill, and a semi-religious ceremony with incantations was being performed for her benefit, in hopes of her recovery. The next morning, after giving a present to the chief man of the village, we resumed our journey down the coast. Early in the day we passed Nósi Sába, and afterwards the villages of Kírakángi and Lúza. Towards evening we had passed Nósi Láva, and arrived safely at Andrúnjina.

This being a Hova settlement, I sent a messenger to report our arrival to the officer in charge, who at once invited us up to the Ruva. After delivering the passes I had from Rakotovau, and the usual preliminaries, the officer made his professions of welcome, gave us a house to use, and shortly afterwards sent on the usual queen's present of food. We stayed here all the next day to look about the country. The Hova officers, too, were glad to have us, for the place is quite off the high-road, and seldom visited by strangers. The district is a dry and barren one—chiefly a reddish loam, elevated some 50 feet or so above the sea.

The next morning we were up early, bid good-bye to our Hova friends, who had been very kind to us in a quiet manner, and set sail across the mouth of Naréndri Bay. A strong wind was blowing, and in two hours we had reached Cape Meromóni, a distance of some 15 miles. Having passed the Point, we proceeded slowly down the coast. Here a soft sandy beach stretches away for several miles, and a belt of fine casuarinas extends all the way just above the high-water line. At night we drew the boat inshore, and camped in a little grove of trees close by. The greater part of the long cape which forms the west side of Naréndri Bay seems to be quite uninhabited. We had not seen a native since we left Andrúnjina. The country is all very dry, sandy, and covered with a bushy vegetation.

As soon as our boat was afloat the next morning we started down the coast again, and in about two hours we reached a great mass of limestone rocks, composed almost entirely of fossils. These extend along the coast for a considerable distance, and the south end forms Cape Mazámba.

The most wonderful feature connected with these rocks, is the manner in which they have been cut up into passages and gullies, by the action of the water. I and two of my men went ashore here to look at the rocks, and then we cut across the country to some Sakalava villages, situated at the head of the Bay of Mazámbu. We waited for the boat to come up, and intended to go on; but, the water being low, we could not get away. We therefore applied to the Sakalava chief, who gave us a house, and we stayed for the night. There are some large tracts of swampy ground at the head of the bay, covered with belts of the rafia palm. This palm is largely used by the natives in the building of their houses, and many constantly employ themselves in peeling the skin from the young green leaves, which they dry, roll up in bundles, and sell to the coast traders. This forms the rafia grass so much used by gardeners.

We started out of the bay the next morning about seven o'clock, and proceeded down the coast towards Mahajámba Bay. In about two hours we arrived at a little rocky bay where a European ship had gone ashore, and was afterwards broken up by the Sakalavas. Some few pieces of her timbers still remained on the beach. Moving slowly along the beach, we came to Ambúngumbé, a kind of makeshift village just under a high cliff. The people were a mixture of Sakalavas and Makuas, who had come from their villages inland to do some fishing. We stayed with them three days; they were very quiet, pleasant people, and gave us guides to take us wherever we wanted to go. The country is an elevated plateau of red sandstone, ending abruptly in a perpendicular cliff near the beach. The plateau is covered with a thin forest, but there are no large trees. The ground is very dry, and apparently very unfertile.

Leaving Ambúngumbé, I intended to go to some of the villages at the head of Mahajámba Bay, and stay for a while; but when we were near the entrance, the "varatraza," or land-breeze, was blowing so strong that we could not enter, so we had to pass on and make the best of our way towards Mujangá. It was as well, perhaps. I was not able to visit these villages, for shortly afterwards they were attacked by "marafela," or robbers, the places looted, several natives killed, and amongst them a French trader. In the evening we anchored off Márasakúa, and the next day, after a long run down the coast, we rounded Cape Ampásimárini, arriving at Mujangá about three o'clock in the afternoon. Here I received a hearty welcome from Mr. Stratton C. Knott, British Vice-Consul at Mujangá, and by his kind help I quickly obtained a house and settled down comfortably for my work.

By Mr. Knott's assistance, I soon got through the usual formalities incident upon a traveller's arrival at a Hova centre. He kindly introduced me to the governor-general, obtained for me the necessary papers and passes required by one travelling about in the district, and afterwards we went together to a grand dinner given by the governor-general to celebrate the departure of his son for France. Mujangá stands in great contrast to all the Malagasy towns on the west coast. It is the only one that has good stone-built houses, and these give the place quite a substantial-looking appearance. They are all built as near as possible to the beach, and belong chiefly to the Hindi traders. The native houses are built chiefly of palm-leaves, sticks, and rushes. The Hova part of the town is built on some rising ground about half a mile inland; and a short distance away there is an old dilapidated fort. Groves of mango trees, guavas, and mabibu cover the adjacent country, and give a most pleasant shade.

After a few days' stay in Mujangá, I left for a trip inland to Bétsáku, a Hova station some fifteen miles distant. The first stage brought us to Anpárangídu. Here we rested for the night, and the next day, after a march of about ten miles, we reached Bétsáku. The whole of the country is very undulating. There are numerous lakes, which abound with crocodiles and fish; they are also the home of a great variety of ducks and other water-loving birds. Bétsáku is situated on rather rising ground. It is not a large place now, but the surrounding country seems to indicate that when it was held by the free Sakalavas it must have been a very populous district. Here the lakes are much larger than those we passed on the road; they are all surrounded by belts of rafia palm; and crocodiles, fish, and water-birds are present in great numbers.

I went through the usual formalities with the governor in charge as soon as I arrived. He received me very graciously, and placed one of his houses at my disposal. The usual queen's present of food was duly sent in, and this was followed by a friendly interchange of visits between the governor and myself.

I remained collecting in the country for about three weeks, and then returned to Mujangá. The day before leaving Bétsáku, the governor gave me a farewell dinner. After dinner he called up all the women and girls of the place before the front of the house, where they went through a series of song-singing; they were then drilled in groups like soldiers; and after this they performed four or five charades, accompanied by singing and acting. This over, I had to give a present to the governor for them, and they retired.

On reaching Mujangá I shipped my collections home by the mail, and then hired a boat to take me to Antsúha, a place some 30 miles west-south-west of Mujangá. To reach this, we had to go outside Bémbatóka Bay and down the coast past Nósi Makúmba. Towards evening we anchored just inside one of the many inlets hereabout, and next morning proceeded up the river with the tide. We had hoped to reach our destination during the day, but, the water failing us, we did not reach it till noon of the next day. A new village had recently been built on a point of land nearly surrounded by water. The old place had been deserted because some one had lately died there, it being on that account considered bad. The natives here are of the worst kind of Sakalavas. They have never been conquered by the Horas, and for many generations Mohammedan immigrants from the Comoro islands and Zanzibar have had considerable influence amongst them—so much so, that all their chiefs and many of their people make a kind of profession of Mohammedanism; and they are amongst the leaders of the West Madagascar slave trade. This trade is, or was, very extensively carried on at every place of importance on the coast between Mujangá and Mórondáva; most, perhaps all, of the slaves passing through the hands of these Mohammedan traders from the Comoro islands and Zanzibar. They fetched cargoes of Makuas from East Africa to sell to the Sakalavas, and the Sakalavas selling to the Mohammedans all such other Malagasy people they had taken by war or in any other way.

On account of the slave trade, the Sakalavas along this piece of coast have the greatest objection to Europeans visiting their country, for their Mohammedan friends have not failed to inform them with what aversion white men, generally, look upon the traffic, and of the means which are used to suppress it. This has made the strip of country between Mujangá and Mórondáva almost, if not quite, the most difficult to enter of any in Madagascar, and to this day the whole of the country lying inland from this part of the coast is little or no better known to Europeans than the Máhafáli or Antandrói countries in the south of Madagascar. The chief of Antsúha seemed somewhat friendly when I arrived, and gave me a house to use, but when he found he could not get from me everything he asked for, he began to make himself disagreeable, and put obstacles in the way of my men collecting the things I wanted. I only stayed about a week in the district, and then returned to Mujangá.

My next short journey was to Katsépi, a Sakalava town and district lying on the west side of Bémbatóka Bay, and opposite Mujangá. We went by boat, and arrived in the evening. On landing, a messenger was sent to the queen, who ordered a house to be given us. This was done, and the queen sent word that she would see us on the following day. The next morning I sent my men off collecting, and in the course of the day the queen came. I had to tell her my business, though she had already learnt it; afterwards I gave her a considerable present, and she granted her permission for me to collect whatever I wanted. I spent about a fortnight hunting all over the country. I did not get much in insects, but secured some fine specimens of lemurs.

The country is of mixed formation—that near the coast very undulating, covered here and there with belts and large patches of forest, other parts open and clothed with a coarse grass. Some of the highest spots are crowned with huge Sakalava graves. These are from 50 to 60 feet long, 15 feet wide, and 5 or 6 feet high. They are enlarged from time to time by fresh bodies being buried at the ends, and further accumulations of stones added. The part of the country near Bémbatóka Bay is flat, and composed of a hard kind of limestone. In it there are numerous deep holes and cavities; everywhere the softer parts of the rock have been washed away, leaving only hard rocky points, which are most difficult to walk on. The whole of this part of the country is covered with a thick forest, the home of several species of lemurs, the wild boar, and guinea-fowl. Having finished my collecting here, I returned to Mujangá, where I packed up my collections, and Mr. Knott kindly undertook to ship them home for me.

When I left Mujangá by the French mail, my intention was to land at Máintiránu and collect there for a time, but on the steamer's arrival off that place, there was such a high sea running that it was impossible to land, and I had to go on to Mórondáva. On arrival at Mórondáva I received a most hearty welcome from Mr. W. Donavan, one of the chief traders of the place, who kindly gave me the use of one of the houses in his compound, and assisted me in every way possible.

The place commonly called Mórondáva is really a sandbank named Nósi-miándraki. The village of Mórondáva is situated some two or three miles more south, and was formerly a rather important place, but now Nósi-miándraki takes the lead. It is here the mail-steamer calls, and all the traders have their houses of business. The country round about is a large flat delta formed by the river Mórondáva, which here enters the sea through a number of creeks and streams which cut the delta into several small islands. These are mostly covered with a dense mangrove vegetation, and the whole district is very unhealthy.

After a few days' stay about Mórondáva, I started off to Mahábu, a district some two days inland. I could have gone by water, but I prefer the road to the milanga, a shallow, round-bottomed canoe. The path took us through a long stretch of mangrove swamps, and then we crossed a large marshy plain. Here there is a considerable settlement of free Makuas. It is a pleasure to contrast their clean, tidy homesteads with the dirty hovels and surrounding of the Malagasy. The Hovas especially are the dirtiest in their houses and town of all the Malagasy I have seen. I had met some of these Makuas at the coast, and on arriving at their village they gave me a hearty welcome. They were delighted at my being able to converse with them in Swahili, and more especially when they learnt that I had travelled all about their fatherland, the Makua country, in East Africa. Anything they had I was welcome to. Most of these people are professedly Mohammedans, but some few attend the Norwegian Lutheran Mission Church close by. Passing on from the Makua settlement, we entered a thick forest of rather bushy trees. We traversed this for some distance, and then arrived at a large open space occupied by a Sakalava village. The natives here keep a good number of cattle, so I wanted to buy some milk. On offering some silver in payment, they refused to take it; it was "fadi," a forbidden thing, for them to use silver. They absolutely refused the silver, but gladly took two or three empty bottles in exchange.

The next part of the journey was through a forest growing in an immense swamp. This is always somewhat muddy, and especially so at spring tides, at which time it becomes covered with salt water. We now arrived at a piece of country which had formerly been covered with a dense forest, but now only belts and patches of it remain; the rest had been cleared away by the natives to make new gardens. The principal feature in the vegetation is some fine Adansonias (baobabs). These are about 10 feet in diameter at the base, and rise up 80 or 100 feet straight, and then send out a small branching top. Sometimes the common baobab, very stout and somewhat short, with large gouty branches, is seen, but the former predominates. Just on the outskirt of the forest we came to a group of villages situated on the left bank of the upper outlet of the Mórondáva river. Crossing to the right bank, we entered upon a large tract of flat bushy country. A little to the left of the path as we went along we saw a number of villages partly hidden by the bush. A few Hovas are settled here, whose duty it is to collect the "isan-pulu" or tax on the produce of the district. The inhabitants are chiefly Sakalavas, with a few Makuas. Proceeding on for about two hours, we came to a wide valley, having a piece of somewhat rising ground stretching along the hollow. On this a large Sakalava village has been built, and there we took up our abode for the night. We had some difficulty in getting a house at first, and even when we had arranged for one we were not allowed to enter it till we had paid the price demanded. This was a rather strange action on the part of a native; but I suppose some Creole trader or other had lodged here previously, and had gone off without paying his bill, and this time the owner intended to make sure of his money.

We started early the next morning, and after four hours' marching arrived at the village of Bésakúa, and made a halt for breakfast. Whilst this was being prepared I went out and shot some sand-grouse, and on returning found it was "fadi" for the natives to either shoot them or bring them into the village; they did not object to my shooting the birds, but requested me not to bring them into the village. These birds, so the natives said, were made "fadi" because they had saved the village from destruction some time ago. A covey of these birds, being disturbed by an advancing enemy, rose up, with their usual loud cackling which they make whilst flying; the natives, alarmed by this, discovered their enemies approaching, attacked them, and drove them away. Thus the birds saved them from a surprise, and their village, probably, from destruction. Two hours' further travelling, and we reached the important Hova settlement of Mahábu. This is well enclosed by a thick reketa (Opontia) hedge, which quite hides the buildings of the town from sight. We halted just outside the principal gate, and sent a messenger to announce our arrival to the governor. The men returning, we were told to proceed at once to the Ruva, where we received a warm welcome from the governor Razafindrazaka. I had previously met the governor at the coast, so had no formalities to go through with him. He at once placed a fine house at my service, and offered to do all in his power to assist me in my work. To celebrate my arrival the governor gave a great dinner, to which all the chief officers of the district were invited, and to help me on in my work he placed at my disposal a number of Ampelakalefu, or Taimero men; these are a brave, hardy race of men, who go in parties all over Madagascar in search of work. They suited me well, for they are not afraid to go about the woods as most natives are.

Mahábu town is divided into two parts, but all is enclosed by one huge raketa fence. The Ruva, dwellings of the principal officers, church, and school are fenced off on one side of the enclosure. The other part is occupied by the ordinary Hova inhabitants, and contain nearly two hundred houses. On the Christmas Eve of 1890, I saw the whole of the houses in this part of the town burnt down in about two hours. A Hova, contrary to law, was distilling some rum for the coming festivities; by some means his house caught fire, and the native building-material being of such an inflammable nature, all efforts to put it down were unavailing, and it burnt itself out. The official part of the town was saved by the huge raketa fence which intervened.

Outside Mahábu town the country is all very flat and somewhat low. It is chiefly covered with a thick forest, with an occasional open space. To the north there is a large lake abounding with crocodiles, and a considerable number of ducks and other water-loving birds. There are no towns in the neighbourhood to the north, but at a short distance to the south the river Mórondáva flows past, and this is well populated on both banks. The people are a mixture of Sakalavas and Makuas, who are generally well disposed towards strangers, but they all have no love for the Hovas. I frequently camped about amongst these villages, and the natives always treated me with kindness and respect.

After a few weeks' collecting in the neighbourhood of Mahábu, I started with a party of men to visit the Máshakúru districts lying to the east of the Tsíandávana hills. Shortly after leaving the town, we crossed to the left bank of the Mórondáva, thence on for a few miles through Sakalava gardens and villages, and we crossed to the right bank again. The river is fordable in many places during the dry season, but when full, during the rains, it is very deep, and the rush is so strong that it is most dangerous to attempt to cross, even in a canoe. Passing along, we came to the ancient burial-place of the Sakalava kings and chiefs. The greatest reverence was shown in passing these tombs, and all, even the Hovas, took off their hats as a mark of respect. The graves are the usual large square piles of stones, only those of the royal family are much larger and better built. At Mórondáva the coast Sakalavas do not bury their dead under heaps of stones, but in the sand, and then build a palisade round the grave with posts, rails, and palings. The top rail is carved with figures of oxen, canoes, crocodiles, and other figures; the posts are generally ornamented with figures of men, women, birds, and water-pots. The road now took us over some rough undulating country, watered by several small streams, and thinly wooded. Towards evening we reached a group of Sakalava villages, and camped for the night.

Next morning we resumed our march, and a two hours' brisk walk over a flat bushy country brought us to the little river Tsesí, flowing at the foot of the Tsíandávana hills. After a short rest we had a stiff climb to reach the top of the hill, where there is a wide plateau. This is covered with a short grass, and is almost devoid of trees. The largest tree we saw was a tamarind standing on the edge of a small pond. Close by here the road branches off, one part going north-east to Málimbándi, the other east to Bérunúnu. We followed the latter, and soon saw a change in the appearance of the rocks; they gave one the idea that there had been an immense fire, and all the stones had been melted up into masses of blacksmith's hards, or slag. Now we began to descend, and, following a tortuous path about the hillsides, arrived at a fair-sized stream flowing in a deep gully. Two miles down this stream brought us near to the Bérunúnu villages. We halted and sent messengers to inform the chief of our arrival. After waiting some time, the men returned with orders for us to proceed to the village. Here we were met by the chief and his people, to whom we explained the reason of our presence among them. When the usual formalities were ended, the chief gave me two good houses for my use, and then sent in a big present of food—a goose, fowls, ducks, rice, and eggs, and a promise of as much milk night and morning as I liked to use. We were soon comfortably settled, and then I visited the chief in his own house, and, after explaining to him more fully what I wanted to do, thanked him for the very friendly reception he had given us; and he then informed me that the country was open for me to go where I pleased, and that he would give me men whenever I wanted them to guide me about. This was exceedingly kind of the old chief, and the best of it was he kept his promise to me.

I remained some two months in this district, and here shot my first fusa (*Cryptoprocta ferox*). He was curled up on a big branch of a tall tree. I thought it was a large kind of lemur; a charge of buckshot brought it down, and I was agreeably surprised to find it was the animal

I had been so long looking for. I had seen one previously at the foot of Békulúsi hill, but, being without a gun, was unable to get it.

I remained in the neighbourhood of the villages for the first few days, and then went and camped about the forest, the old chief every now and then sending me fowls, rice, and other food from the village. He also gave me two oxen to be killed for the men who were with me. These did not cost him anything, for he was really the chief of a band of marafela, or cattle-stealers. Whilst I was there the men brought in three large herds which they had stolen from some villages at a distance. The hillsides are covered with a thick forest, and are alive with lemurs, fusas, wild boar, and many other animals. The valleys are low and swampy. There are many good-sized lakes, which abound with ducks, geese, and other wild-fowl. Across the large valley a piece of slightly rising ground forms a kind of watershed; the water on the south drains into the Mórondáva river, that on the north enters the Tsiandúa—a considerable stream which flows into the Tsíribihína—and thence into the sea at Tsimánandrafúzana.

When I had finished my work of collecting, I returned to the coast by way of Mahábu, taking two men with me from the old chief who had been so kind to me. These I sent back again with presents to the chief, that he might see that I had not forgotten him nor the kind manner in which he had received me.

Soon after my return to Mórondáva from my expedition to the Máshakúru at Bérunúnu, the little French steamer *Mpangaka* arrived, on her way to Nósi-vé. My collection inland had been packed up and handed over to Mr. Donavan, to be shipped home by the next mail. The men who had accompanied me thus far, being frightened by the wonderful stories they had heard of the Sakalavas and Mahafalis in the south, declined to go any further, so I had to discharge them; only one man, a Hova, Rabe by name, ventured to go on. With him I embarked on board the steamer, and, after a fair run of twenty-four hours, arrived at Nósi-vé. This is a small sandbank, nearly a mile long and about a quarter of a mile at its greatest width, surrounded by an extensive coral reef. It is situated about 3 miles off the Mahafali coast, in about lat. 23° 40′ S. It was uninhabited some forty years ago, but at that time the Sakalavas and Mahafalis became so extortionate and troublesome to the traders, that they all retired to this island, and made it their head-quarters. Now it is nearly covered with traders' houses and stores, and has become the principal trading-place on the south-west coast. The traders are English, French, French Creoles from Mauritius and Bourbon, and Hindis from Zanzibar and Bombay. The native population is made up of a mixture of Sakalavas, Mahafalis, Hovas, Antinosi, some few Makuas and Betsimisarakas. The French have established a Vice-Presidency here.

On arrival at Nósi-vé I went at once to Mr. Oman, a well-known merchant, and was received by him in the most hospitable manner. I stayed in Nósi-vé for about a month, and then went over to Salári, a small Mahafali village on the lowland, near the mouth of the Ong'ulahi river. Here Messrs. Proctor Brothers, of London, have a station, and Mr. Hooper, their agent, kindly invited me to take up my quarters with him. My chief object in coming to this part of south Madagascar was to penetrate, if possible, into the Mahafali country, and for this purpose I remained for several months about Salári and its neighbourhood. I made several attempts to get inland, but was always baffled by the natives, who have the greatest objection to Europeans entering their country. Finding my efforts in this direction were so far unsuccessful, I resolved to go away for a time and explore and collect along the coast north of St. Augustine's Bay. For this work I bought a good-sized lakam-piara (outrigger canoe), and hired a sailing-boat of about three tons, and with these visited and collected in all the chief places between Lámbuhára, lat. 22° S., to St. Augustine's Bay.

The most northern part I explored in this manner was Murder Bay. This is an extensive inlet, bounded by wide mangrove swamps. On the north side of the bay the swamp is cut up into a number of islands by creeks which traverse it in all directions. There are several Sakalava villages on the north side of the bay, and on the bank of one of the creeks the trading station of Lámbuhára is built. The traders are chiefly Creoles and Hindis. The Hovas have no authority in this part of the country, nor any, in fact, in all the districts lying between lat. 21° 30′ S., a little south of Mérondáva, and Tuliá in St. Augustine's Bay. The whole country is purely Sakalava, and ruled by Sakalava kings. These are somewhat despotic in their manner, as their actions sometimes show.

On the south side of Murder Bay, three or four groups of houses form the village of Itampúlu-bé. It is built close to the coast, on a flat limestone formation. All the country round about is of the same formation. In it there are some basin-like depressions, now silted up. The upper stratum is a soft black soil, and underneath there is a thick layer of white or greyish loam, full of fossils. Here I procured some of my finest specimens—remains of æpyornis, hippopotamus, bos, potamachærus, crocodile, and various other mammals and birds.

The country inland is a vast flat, very fertile, extending inland to the range of hills, which stretch in an almost straight line from this place to St. Augustine's Bay. There are a number of lakes about the flat, one very large not far from the king's town. There are but few natives living on the coast in this part of the country, most of the Sakalavas here being Máshakúru. The southern Sakalavas are divided into two sections rather than tribes. Those on the coast are chiefly Vezu, whose principal employment is fishing and boat-sailing, though they do some amount of gardening, and keep good herds of cattle. The other section are called Máshakúru. They are essentially herdsmen and agriculturists. The Vezu despise the Máshakúru because they are countrymen or bushmen; the fiercer Máshakúru look with contempt upon the Vezu because, though noisy, they are cowards.

Nearly all communications between places on the coast are performed by boat or canoe. A reef extends along the coast at a distance varying from half a mile to three miles, and this, breaking the heavy seas, make it perfectly easy and safe travelling. There are several openings in the reef, by which larger vessels can enter either for safety, or to bring up at the villages along the coast.

Leaving Murder Bay, we rounded Isípuki point, passed Vúhits-ábu or Talá, down past Famátaléfu or Mándi, thence to Ambátumilú and on to Mámiránu. Most of these places were inhabited formerly, but now it is quite deserted. The coast-line is generally a succession of sandhills, but here and there sandstone rocks crop out, and these are frequently covered with a limestone, coral formation, or perhaps it is a kind of fossilized wood. I brought some specimens of this rock home for examination.

Leaving Mámiránu, we passed Ándravúnji and Salári. Near this place there is a large opening in the reef, named Kazu-bé-vuhitsi, through which a ship of a hundred tons or more can enter. Thence we went on to Ambátumifúku (the place where the water makes a noise in the holes of the rocks). A most interesting line of sandstone rocks extends along the coast. In making an examination, I found they contained quite a number of land-shells very similar to species still found alive in the locality; but what surprised me more was to find pieces of the broken egg-shell of the æpyornis embedded in the rock. This circumstance alone is proof of the vast antiquity of the bird. The tops of these rocks are covered with either a coral formation, or what I think may be fossilized wood.

This line of rocks, besides stretching along the coast for some distance, extends inland for two miles or more, and on the side facing inland there are extensive waterworn caverns, in which I was fortunate enough to discover, at different times, several fossil carapaces of gigantic tortoise (*Testudo grandidiere*). Two of these are now in the Geological Gallery of the British Museum, South Kensington, and one or more in the museum of the Honourable W. Rothschild, at Tring. From the reports given me, I believe there are many other caves and places in the neighbourhood still worthy of being examined.

From Ambátumifúku we proceeded south, and passed quite a number of places previously occupied by villages, but now deserted—Tampúlu, Tsíandámba, Isaléka, Isífuta, Ampásiláva, Ankílimihúaki, and Fihiérng'a-masai. This latter place, as we went up, was inhabited, and apparently in perfect safety; when we returned we found it quite deserted—the people had been frightened away by reports of Rungavuli. Thence we went on to Melíkuki, a dangerous rocky point stretching out some distance into the sea. On this point, the "lulu," or huge stone graves of some of the chief families of Manúmbu, are built. A short distance further on and we came to Manúmbu. This is the largest Sakalava town on the west coast of Madagascar, and contains, probably, between three and four thousand inhabitants. It is divided into two parts by the river Máhanúmbu. Manúmbu proper is built along the sea-coast on the right bank of the river; the other part, Fitsítiki, along the coast-line on the left bank. It is inhabited chiefly by Sakalavas, and a few Makuas; to these must be added a few European, Creole, and Hindi traders. The king of the place, and all the surrounding country as far as the river Ong'uláhi, is Tumpumana—now a fairly quiet man, but formerly a terror to all traders and strangers in the country.

I had occasion to visit the king some three or four times. All foreign strangers when visiting the king are supposed to shake hands with him, instead of grovelling before him as the natives do; but he makes them pay for this concession by demanding that every white man shaking hands with him for the first time shall at the same time leave a piece of gold in his hands. The various towns and villages are ruled by the local "masondranu," or chiefs. Those of Manúmbu are Tsialala, Saruveta, and Mahiti. They try all the cases which arise between natives, or natives and strangers; but they are not allowed to do it all their own way. All the freemen of the place have a word in the matter, and if it cannot be settled satisfactorily, then an appeal is made to the king.

From Manúmbu we went on to Ambúlisátra, passing on our way Úrantámbu, Kúafasi, Andrévuki, Fanandúmutsi, Itúnga-bé, and Béfutúa. The only inhabited place is Andrévuki, a small but rising town. There is not a town really at Ambúlisátra, only a few little huts occupied by some herdsmen who here attend to the king's cattle. There are several herds, some belonging to kings, or rather named after kings of generations back. All these are kept separate from the present king's cattle, and supply the necessary victims for the royal sacrifices.

The district of Ambúlisátra is important, for here has been discovered some of the most remarkable fossils of Madagascar. M. Grandidier, several years ago, made some of his finest discoveries here. I made several visits to the place, and was equally fortunate, especially in finding the head of the *Megaladapis Madagascariensis*, a gigantic fossil form of lemuroid. This has been described in *Philosophical Transactions* of the Royal Society by Dr. C. J. Forsyth Major. This is a remarkable piece of flat country, and has, undoubtedly, at some remote date, been occupied by an extensive lake, of which only pond-like depressions remain. I believe there are neither fish nor crocodiles in these small lakes, but I have frequently seen some hundreds of the scarlet flamingo (*Phœnicopterus erythreus*) congregated there.

Passing on from Ambúlisátra, we sailed for several miles along a piece of coast well wooded and somewhat rocky. At one time it had its towns and people, but now only the names remain. These are Antévaména, Máraházu, Fáti, Berávi, Lúhatáng'a. A considerable lake inland is named Ránu-bé (Big-water), and a village near by takes the same name.

From Lúhatáng'a a long stretch of sandbanks extend to Fihireng'a, or Tuliá. On these banks there are a number of small villages—Belítsaki, Bélalánda, Ambúliránu, Ambaráta, and others—inhabited chiefly by Vezu-Sakalavas, who are somewhat under the control of the Hovas at Tuliá, but ever ready to take to their canoes and decamp should they feel the Hova authority bearing too heavily upon them. Fihireng'a—or Tuliá, as it is often called—is the chief Hova station in South-West Madagascar, the head-quarters of the few little stations round about. From this place to near Fort Dauphin, on the south-east coast, the country is entirely in the hands of the natives, nor would the Hovas dare to go into the country. Even here about Tuliá the Hovas have no established authority over the natives, who look up to Tumpumana as their only king and ruler. The principal business of the Hovas is, apparently, to collect the isan-pulu or custom duties, and they do not seem to do anything else. Certainly they do nothing for the Sakalava natives, for they neither restrain them in their tribal wars and disputes, and protect them from the raids of robbers, who carry off both their cattle and people, nor have they established any schools or used other means to elevate them in any way.

The town of Tuliá is built on a long sandbank running parallel to the beach, and is a somewhat important trading centre still. But previous to the arrival of the Hovas it was the chief town on the coast; now Manúmbu takes the lead in numbers. At the back of Tuliá there is a large tract of flat country, very fertile, formerly cultivated by the Sakalavas, but now abandoned.

So much has been written concerning the Hovas, and so little about the other tribes, that there is a general impression that the Hovas have established themselves all over the island. This, however, is quite a mistake; probably not half the natives of Madagascar recognize the Hovas as their rulers and Ranavalona as their queen. A straight line might be drawn from Mujangá on the west coast to Fort Dauphin on the south-east; there are but few real subjects of Queen Ranavalona west and south of that line. Most of the minor tribes in the south-east are as free as ever they were, and much the same may be said of the Antankaranas in the north.

The burial-place of the southern Sakalava kings is situated a few miles inland from Tuliá. This is enclosed and constantly guarded by a certain family of Sakalavas. No one is allowed to enter except at royal funerals or on certain appointed occasions. In a piece of water not far from this place there are a number of crocodiles which are considered sacred, and no one is allowed to kill any of them. They are preserved for the sake of their teeth. When a king dies, a crocodile is caught alive, one of its large teeth extracted, and then it is set free again. The hollow tooth of the crocodile is required as a receptacle for "gini" of the late king; that is, a tooth, finger-nails, and other parts which are held to be sacred, and must therefore be preserved.

After returning to Nósi-vé from Ampaláza, I went on several short collecting trips to Manúmbu, Tuliá, and other places on the Sakalava coast.

When I arrived again in Nósi-vé after these trips, I learnt from Mr. Oman that Befanatriki, an Antinosi king from the interior, was coming to the coast. Mr. Oman, as well as myself, wanted to go inland, and thinking that probably the king would allow us to go up with him when he returned, as soon as we heard of his arrival at Anatsúng'u, a town at the mouth of the Ong'ulahi river, we went over to see him. He received us very kindly, and not only readily fell in with our wishes, but also agreed to supply us with all the porters we needed for our baggage.

On the third day the king gave the order to start. We were a party of about eighty, all told; the king remained behind with his wife and a few men, saying he would come on shortly. Our path took us through the gardens on the strip of low ground on the right bank of the Ong'ulahi. The first day's journey was a long and tiring one, partly over sand, sometimes in the river, and in other places carefully picking our way along the steep and rocky spurs of the hill, which here slopes down into the deep channel of the river.

We passed several villages as we went along, the most important being Ifenuarívu, the residence of Ramara, an influential Sakalava chief.

Towards evening we entered the district of Ilánza, held by an independent Sakalava chief named Tsilivani. Next evening Befanatriki came up with his household and the rest of the men, and the next morning we resumed our march. This took us by a tortuous path up the hillside till we reached the plateau above. Here the path took a north-north-east direction. At night we encamped in the thick forest near the path. The Malagasy never like to camp in the open, nor yet keep up fires at night. The whole of this district is an elevated sandstone mass, overlaid with a stratum of limestone full of shells. The country is covered with a thick forest, with here and there open glades clothed with a coarse grass.

The next morning we resumed our journey, and passed over a more undulating country, and finally came out on a broad open plain. This is but lightly wooded, excepting a few belts of forest here and there. A number of lakes are dotted about the plain, but during the dry season they become nearly dried up. About the middle of the afternoon we had crossed the plain, and arrived at the edge of the plateau, from which we could look down into the valley which extends to the Ong'ulahi, some 10 miles away.

After a few days' further march we reached the large village of Ilúnti, and crossed to the left bank of the Amantaki. We then went on in an easterly direction over some undulating ground till we reached the Isakamaré, and crossed over to the left bank; thence our course was almost due north. We had now reached the northern end of the Bekuráki range. Going on, we found the hills on the right bank of the Isakamaré, a continuous unbroken range. Those on the left bank form a group most extraordinary in conformation and appearance. They rise to a height of about 1500 feet; the sides, which are very precipitous, and in some places quite perpendicular, enclose narrow valleys, coursed by small rivulets which flow into the Isakamaré. The scenery is of the most varied composition. In one place the towering rocky masses induce a feeling of awe and grandeur; a little further on, another reach of the smooth-flowing river, with its banks graced with beautiful hanging ferns and stately palms, presents a scene of quiet and repose. After advancing up the river between the hills for some 4 miles or more, we came to the village of Ambatulúaki (at the hole in the rock), and rested. This is the most northern part of King Befanatriki's country.

After a brief stay we commenced our return journey down the Isakamaré. The most remarkable feature about the whole country we had traversed was a number of bogs or old lake beds we came across; not only were they common all over the open country, but even in the little valleys between the mountains on the Isakamare we found them. It seems as if the lakes are a very old formation; that the sandstone hills, which are really only part of a large plateau which covered all the country about, are of later date. This plateau has now been washed away in many places, and the old lakes are brought to light again. There is no forest about the country; the nearest piece of real forest is Ambúliála, situated some 15 miles north of Manansúa. The country generally is not very fertile; but all the damp places, bogs, and marshy places are especially good, the natives every year being able to raise two crops of rice upon the same piece of land. The cultivation of rice forms the chief occupation of the Antinosi; large quantities are raised and conveyed by "laka" to the coast, and then sold to the Sakalavas. All the chiefs and many of the people keep large herds of cattle—not that they deal much in them, but they are rather a mark of the owner's wealth and position.

Shortly after this Mr. Oman returned to the coast, but I remained at Manansúa to continue my work of collecting. This I continued for some nine months, making short trips and camping about the country in all directions. Whilst engaged in collecting insects, birds, and other natural history objects, I also engaged some men to excavate among the dry lake beds at Ilúnti and Ifúnsi, with the result that I found at both places a number of broken carapaces of a gigantic tortoise and of some smaller species. Amongst these fossils there were also fossilized remains of the æpyornis, hippopotamus, crocodile, and other animals.

One of the longest journeys I made during this period was done in company with Befanatriki, who went on a visit to his friend Lahmanzaka at Béfamáta, on Laki Ihúti.

I now began to make preparations for returning to the coast, and I was very eager to perform the journey by canoe down the river. This was at last arranged in company with Befanatriki, his wife, and a considerable retinue. Our first reach down the Ong'ulahi river was in almost a south-west direction, between a lot of sandbanks. All the right bank is very low, the other side somewhat higher and bushy. The next morning brought us at an early hour to the mouth of the Isákamadíu, a considerable affluent of the Ong'ulahi. Here the country is much more hilly, rough, covered with rocks having the appearance of volcanic origin, and all is covered with a somewhat dense forest. Further inland, where the country is higher, there is no forest, but the country is clothed with a coarse grass.

Leaving Andávakakíu (at the shark's hole), the stream carried us along in a somewhat north-west direction for about 3 miles, and then we arrived at the important town of Sálu-avåratsi. Here we remained for three or four days. King Befanatriki, who is nephew of the king of this place, had some business which detained him. This place is the eastern limit of a curious geological formation, abounding with hot-water springs. The line of country occupied by these springs lies in a south-west course, and extend from Sálu-avåratsi in the east to Andránumái on the left bank of the Ong'ulahi in the west, and is some 10 miles wide. The hot spring of Sálu-aváratsi is just outside the village gates, where the water rises out of a great bed of limestone. It is used by the natives for all purposes. The steam from the rising water gives off a rather unpleasant odour, but this passes away as the water cools down.

From Ambúruki we went on to the villages of Béfamáta. Close by these villages there is a large lake, some 2 miles in diameter. It abounds with fish, crocodiles, and birds. It is said that formerly there was an extensive morass here, and the Sakalavas, living in a village on the top of Ivúhi-bé, used to have their rice-gardens all over the place. Suddenly, however, there was a depression, and the place was flooded with water from the Ong'ulahi. There are none of the inhabitants now living who remember the change taking place.

Resuming our voyage down the river, we passed the mouth of the Tahéza, the most important tributary of the Ong'ulahi, on its right bank. Further on we came to the village of Behísatri, a place geologically interesting. The village is built on a sandstone hill. The hill is, I suppose, part of the old sandstone plateau which formerly covered the whole of the country. The channel of the Ong'ulahi, sweeping under the foot of the hill, has washed it away so as to form perpendicular cliffs. Here one gets a fine section of the strata, which are as follows: a thin layer of blackish soil, recent vegetable *débris*, followed by several strata of variously coloured sandstone to within 4 feet of the water. The next stratum is a hard greenish-black mud which descends below the water's edge. This lower stratum I take to be the bed of some lake of a very old formation.

In the district of Bevítiki we reached the high plateau which occurs on both sides of the river, and which extends to the coast. The upper part or stratum of this plateau is formed of a fossiliferous limestone, then a thick mass of red sandstone resting on the stratum of a hard black stone, or rather various-shaped lumps of hard black stone, with the interstices filled up with a kind of limestone. The general height of the plateau is from 1500 to 2000 feet. It is covered everywhere with a thin forest, formed chiefly of different species of Euphorbia.

There is nothing of interest to note during the rest of the journey.

THE U.S. GEOLOGICAL SURVEY.

By MARCUS BAKER.

THE year 1894 marks an epoch in the history of the U.S. Geological Survey. Major J. W. Powell, its efficient director almost from the beginning in 1879, resigned his office in May, 1894, and was succeeded by Mr. Charles Doolittle Walcott. This event, therefore, makes 1894 a transition year; a year which may be said to close an old and begin a new chapter.

It will be remembered that the Survey was created March 3, 1879, by a consolidation and reorganization of three pre-existing surveys, known respectively as the Hayden, Wheeler, and Powell Surveys. Mr. Clarence King, the first director, resigned his office so soon after entering upon it, that the present development and organization of the survey is chiefly due to Major Powell, who directed its course and work for thirteen years, 1881–1894.

In noting the transition from the old to the new *régime*, a word or two respecting the two directors may not be out of place.

Major Powell is a striking personality, whose sturdy and independent thinking and acting has strongly impressed, and still impresses, all who come within reach of his voice or pen. The present Survey is in large part his creation. Under his guidance, it began on a moderate scale and grew rapidly. The confidence and support of Congress was won, and an increasing number of enthusiastic co-labourers brought into the work. The buoyancy of youth and hope pervaded the organization. Affection for the leader and confidence in him was unqualified. The annual budgets steadily increased, and all was bustling activity. In

1888 Congress created an irrigation survey within the Geological Survey, and made generous appropriation therefor. But antagonism in the western part of the country soon arose, resulting from titles to land affected by the new law. Accordingly in 1890 the irrigation survey, after a short life of two years, was abolished by withholding appropriations, and the Geological Survey was much reduced. Many discharges were necessitated, and reorganization resulted. So reduced and reorganized, it continued till May, 1894, when Director Powell surrendered the leadership to his younger successor, Mr. Walcott.

Major Powell lost his right arm at Shiloh in 1862, and the stump has been a source of unceasing and increasing pain for years. On surrendering the directorship he went at once to Johns Hopkins hospital, in Baltimore, and underwent a successful surgical operation, setting him free from pain. Thus physical pain and administrative care vanished together, and now, pain-free and care-free, he is conducting the Bureau of Ethnology, and pursuing his philosophical studies and writings.

Mr. Wolcott was a member of the Survey, and had been for fifteen years when he was promoted from chief geologist to director. The successor to a great leader finds much expected of him. Unless he be a strong man, and especially if he be a young man, unfavourable contrasts are liable to be pointed out. That they have not been in this case is proof of the wisdom of the choice. Mr. Walcott assumed formal conduct of the Survey's affairs on July 1, 1894.

In the United States the calendar and fiscal years are not identical. Reports of progress by the various bureaus and departments of the government are usually for the fiscal year beginning July 1, and ending June 30. The last report issued under the direction of Major Powell is known as the 'Fifteenth Annual Report,' and covers the period July 1, 1893, to June 30, 1894. This report, now stereotyped and about to go to press, is in one sense a farewell volume, and summarizes the Survey's work down to midsummer, 1894.

The facts and figures in that report all set out in due order, and, in the stiff, official form usual in government publications, exhibit the Survey's progress and results. But the interesting background of motive and men, of hopes cherished or plans conceived but never executed, of the inner life of the organization, its *esprit de corps* or the want of it,—these and many other things do not appear in it. Indeed, such facts hardly get published at all, except as scraps more or less coloured by the unknown author's conscious or unconscious bias. Only at the club or social dinner is one permitted to get any near or clear view of the inner life or of the undercurrent of governmental workings.

From thirteen years' continuous work by the U.S. Geological Survey have resulted 900 topographical maps and 120 books. Let us amplify this curt and bold statement, and especially let us explain the absence of geological maps. That a Geological Survey should be steadily engaged for more than a decade with a large corps of workers and generous grants of money without producing more than a dozen or two geological maps is anomalous, and needs explanation. Imagine, then, a country nearly as large as all Europe, with a population nearly equalling that of Great Britain and France combined. Imagine this country to constitute a single nation, speaking one tongue, and federated together as one unit subject to one single control. And further imagine that nation to be a young member in the group of nations, with great resources imperfectly known. Its chief business, from the nature of the situation, is neither art, nor literature, nor pleasure, but, if I may say so, it is *business*. Its chief occupation consists in the business of developing its resources, making available its stores of metals, of water, and of minerals. To do this it builds railroads, not by single miles, but by hundreds, nay, thousands of miles per year. It builds cities; it develops and utilizes its water-supply, for power, for irrigation, and for commerce. It fells its forests for their timber, and utilizes the cleared land for agriculture. There is so much room, so much freedom, such abundance of resource that the need of economy is neither felt nor practised. So widely do the conditions prevailing in such a new and undeveloped country differ from those established in old countries, that the denizen of the old land visiting the new has the greatest difficulty in understanding what he sees. The difficulty is in the pre-conceived notions he carries with him on his travels. The patriotic American who goes abroad is not less ready to misunderstand what he sees differently done from that to which he is accustomed.

Imagine now this whirlwind of unorganized development of resources to have gone on for a few decades, when the need of improvement in method begins to be felt. Under such an impulse, a Geological Survey is born, and enters upon the work of investigating the mineral resources of the nation and the production of a geological map of its territory. For initiating this work Mr. Clarence King was chosen, but after two years voluntarily resigned the task, which then fell into the hands of Major Powell. Powell entered upon the work with a zeal and energy that were contagious. Full of great thoughts and plans, ripe with varied experience in peace and war, sympathetic, enthusiastic, he inspired all within his influence to high hopes and aspirations, and, more than all, comprehended with great fulness and clearness the problems set before the Survey. His plans were far-reaching, and, his critics said, ambitious.

To make a geological map, he said, two preliminaries are requisite—*first*, a topographical map; and, *second*, such general knowledge of the rock formations to be mapped as will admit a classification adapted to the whole field. If the field to be geologically mapped is small, let us make a hasty or preliminary examination with a view to determining our classification, and, this accomplished, we will then proceed to make our geological map conformable to this classification. This is the course to be followed in a small field. If the field is large, we must still do the same, though the task be rendered more laborious by reason of its size, and increasingly difficult on account of its complexity. This principle, when applied to half a continent, involves extraordinary difficulty. The variety of rocks and conditions are so great, that to devise a system uniformly applicable was believed by some geologists to be impracticable, if not impossible. Many said it could not be done. Some still say so. Yet it has been done, and it remains to be seen whether the adopted system will or will not ultimately break down. The work of actually mapping out the geological formations was therefore, for a number of years, not entered upon. The energies of the geologists were wholly given to a study of various great problems relating to classification. Dissimilar conditions in areas far apart were made subjects of special inquiry, and from comparison of results, from frequent and friendly conference and discussion, by degrees a system of classifying all the rock masses in the United States was evolved and adopted. A colour scheme for showing results was then elaborated, and thus at last, after years of patient preliminary work, actual field-work in the mapping of areal distribution was possible. And this is why, at the date of this writing (May 1, 1895), the Geological Survey of the United States has actually published but *twelve* of the geological atlas sheets of the geological map of the United States, authorized by Congress in 1879, a map which must ultimately consist of many hundreds, or even thousands, of sheets. We will shortly give a brief description of the character of these published geologic atlas sheets.

The other want to be filled before a geological map was possible was a topographical map. But no topographical map existed. How slow, laborious, and costly a work it is to make a topographical map need not be told to an English audience. For is not its Ordnance Survey more than a century old, with its work still unfinished? It is true that the U.S. Coast Survey had for fifty years been at work upon the coasts, charting the tidal waters, from their remotest inland points outward to the sea, and seaward to the abyss. With this hydrographical work it had joined a detailed and accurate survey of a fringe of topography along shore—a fringe from half a mile to a mile or two in width. The U.S. Lake Survey had done similar work on the Great Lakes, and surveyed a narrow border of land along the lake margins. Along the lower Mississippi, the Mississippi River Commission had done similar work. But all the maps thus produced together constituted hardly a "drop in the bucket," hardly more than one per cent. of the area of the United States. And yet the Geological Survey could not go on without maps. Accordingly its director set about the task of securing them. In the Geological Survey in its earliest days was a small body of trained men, who for a decade had been engaged in the Far West in making maps—topographical maps, their makers called them; reconnoissances, their critics disparagingly, sometimes sneeringly, called them. The maps produced by these men working in the Hayden, Wheeler, and Powell Surveys were sketches on small scales of extensive tracts of, for the most part, uninhabited country, the sketches being controlled by a triangulation with small instruments. The scale of these maps was, for the most part, either 8 miles to 1 inch or 4 miles to 1 inch. After studying the problem, it was concluded that the rude methods developed in the West could be refined and improved, and made applicable to a somewhat larger scale and more accurate map; and, based upon the experience gained, it was estimated that a map of the entire country, on a scale of in part 4 miles to 1 inch, and in part 2 miles to 1 inch, sufficiently detailed and accurate for geologic purposes and for all general purposes, could be produced at a cost of about £3,000,000, or about one pound per square mile. This estimate, and the reasons for it, were submitted to Congress, approved, and the work authorized. Thus in 1882 the actual work of mapping the United States on a comprehensive plan was authorized and begun. And it was begun and has been carried on by the U.S. Geological Survey, which is thus in fact, though not in official name, the U.S. Topographical and Geological Survey.

For a number of years, then, after 1882, the energies of the survey were given (*a*) to the production of topographical maps, and (*b*) to the study of such geological problems as would develop a system of rock-classification adapted to the whole country, and thus pave the way for geologic mapping. So large was the field, so complex and difficult the problems presented, and so great the labour, that despite a large number of workers, and despite generous grants of money, more than a decade has been spent in excavating and laying the foundation for a geological map of the United States.

As Major Powell retires from the management of this great task, greatly planned, the first walls of the structure begin to rise. Under Mr. Walcott's direction, the final geological sheets are beginning to appear. At this writing twelve have been issued, and it is hoped that the number may be increased to twenty by July 1, 1895. These sheets, by Mr. Walcott's direction, appear as issuing under the directorship of Major Powell.

And here let me describe one of these geological sheets, or folios, as they are called. Even the best description must needs be but a poor substitute for a personal examination of the folio itself. If this description shall quicken the interest of any reader to seek and find in the map-room of the Royal Geographical Society, or in some public library a copy which he may examine for himself, the author will feel that this description has served a useful purpose.

A geological folio, then, of the U.S. Geological Survey is a large thin atlas, 19 by 22 inches in size, bound in heavy manilla paper. On its cover it bears the imprint, "Department of the Interior, U.S. Geological Survey," followed by the name of the director, and then the words, "Geological Atlas of the United States." The name of the sheet follows, such as Jackson folio, California or Livingston folio, Montana, etc., the sheet being named after some prominent or characteristic feature shown upon it. The sheet is projected without regard to political divisions, and is upon a scale of either 1 : 250,000 or about 4 miles to 1 inch, or 1 : 125,000 or about 2 miles to 1 inch. In the former case it covers one "square degree," or about 3600 geographical square miles; in the latter it covers one-quarter of a square degree, or about 900 square miles. In the "square-degree sheets" the integral parallels and meridians constitute the boundaries. After the name of the sheet comes a skeleton map, called an "Index Map," of a considerable tract of country, within which lies the sheet in this folio, and a shaded area on this index map shows the location of the sheet. A table of contents follows, called "List of Sheets," usually seven or eight in number. The usual imprint completes the page. Printed on the inside of each cover is a simple explanatory text giving the leading facts about the geological map of the United States, of which this folio constitutes one sheet. Its purpose is to describe, in the simplest manner, the great facts about the map, its plan and purpose. "Explanation" is its heading or title, but "Kindergarten Text" is its nickname. The Kindergarten Text is followed by a general description of the geography, geology, and mineral resources of the sheet, entitled "Description of the —— Sheet." This description usually falls under three heads: (*a*) geography; (*b*) geology; and (*c*) soils. The character of this description of necessity varies to fit to various conditions. Some portions of it are applicable to a wide extent of country, other parts relate more specifically to the particular sheet. As the subject treated is somewhat technical, the use of technical words cannot be wholly avoided, but an attempt is made to render the description as simple, clear, methodical, and untechnical as possible. It is intended for the public rather than for the specialist, and the descriptions are accordingly prepared for the public. These folios might, therefore, well serve as text-books in the schools of the regions covered by the folio. The explanatory text appears in every folio, while the descriptive text is specially prepared for each folio. The maps then follow. First, there is a topographical map of the area under consideration, usually on a scale of 1 : 125,000 or about 2 miles to 1 inch, and covering one-half a degree of latitude by one-half a degree of longitude, or one-quarter of a "square degree." This embraces about 900 square miles. This map, engraved upon copper and printed from stone, appears in three colours. The projections, legends, names, roads, towns, etc., in short, all culture, is in black, all water bodies in blue, and all hill features in brown. The hill forms and heights are shown by contours, with an interval ranging from 20 to 100 feet. After this topographical or base map, follows a sheet from the same copper plate, over-printed with geological legend, colours, and patterns. This is entitled "Areal Geology," and by the usual conventions it exhibits the surface distribution of the various rock masses. The legend explains the symbols used, and gives the adopted classification and geological ages to which the groups are referred. A second geological map of the same area follows, entitled "Economic Geology." This differs from the preceding chiefly in printing. Those rock masses already known to be of economic importance from their yield of iron, coal, gold, or other metal, etc., are printed in stronger colours, while the remaining masses, not now known to yield products of economic importance, are printed in subdued colours. This sheet, therefore, quickly and easily exhibits the coal-fields, the iron districts, the gold and silver belts and spots, etc. A third geological map is entitled "Structure Sections." This may be said to exhibit the under geology. The two preceding maps dealt with the surface only. This one takes us down into the skin or rind of our planet to the depth of half a mile, more or less, and shows us what the geologists believe they have found out about its structure. Imagine a trench half a mile or more deep, with vertical walls, traversing England. Take an imaginary walk along this imaginary trench, and study the bedding of the rocks and soils as seen in its walls. The different kinds of rocks can, in our mind's eye, be seen, and their relations to one another, their sequence, their position—whether level, or inclined, or dipping—and their faults, if they have any.

The third map in our folio aims to show the facts which could be seen in such an imaginary trench. A section or several sections have been measured across each sheet, and the section edges, if I may say so, have been turned toward us in their proper places on the map in such wise that we may see the underground structure.

The last leaf of our folio is neither map nor text, but rather a diagram, entitled "Columnar Sections," whereon is shown the geological age and thickness of the various rock masses met with as we penetrate the rocks of the region on the folio—a sort of generalized well, it might be called. In some folios the result of several specific borings are shown.

This imperfect description of a folio must suffice. Even if it were better it would still be a poor substitute for a personal inspection, which it is hoped that all interested may have opportunity to make.

The proposed edition of these folios is five thousand, and a plan of distribution has been tentatively adopted. Questions come almost daily to the Geological Survey about the folios, and a circular has been prepared to meet such inquiries. From the circular dated March 1, 1895, we quote the following:—

"Under the law, a copy of each folio is sent to certain public libraries and educational institutions. A limited number of copies are reserved for distribution to persons specially interested in the region represented. This distribution is at first gratuitous, but when the remaining number of copies of any folio reaches a certain minimum, a charge equivalent to cost of publication will be made. In such cases prepayment is obligatory. Remittance must be made by money order, payable to the Director of the United States Geological Survey, or by currency—the exact amount. Postage stamps, checks, and drafts cannot be accepted. The folios which are ready for distribution are listed below.

"This circular, which will be revised from time to time as other folios are completed, may be had on application. Communications should be addressed to—

"THE DIRECTOR,
"United States Geological Survey,
"Washington, D.C."

FOLIOS READY FOR DISTRIBUTION.

No.	Name of sheet.	State.	Limiting meridians.	Limiting parallels.	Area in square miles.	Price in cents.
1	Livingston.......	Montana.....	110°-111°	45°-46°	3354	25
2	Ringgold........	Georgia...... Tennessee....	85°-85° 30′	34° 30′-35°	980	25
3	Placerville	California....	120° 30′-121°	38° 30′-39°	932	25
4	Kingston	Tennessee....	84° 30′-85°	35° 30′-36°	969	25
5	Sacramento......	California....	121°-121° 30′	38° 30′-39°	932	25
6	Chattanooga	Tennessee....	85°-85° 30′	35°-35° 30′	975	25
7	Pikes Peak	Colorado.....	105°-105° 30′	38° 30′-39°	932	25
8	Sewanee.........	Tennessee....	85° 30′-86°	35°-35° 30′	975	25
9	Anthracite-Crested Butte	Colorado.....	106° 45′-107° 15′	38° 45′-39°	465	50
10	Harpers Ferry ...	Virginia..... West Virginia Maryland....	77° 30′-78°	39°-39° 30′	925	25
11	Jackson.........	California....	120° 30′-121°	38°-38° 30′	938	25
12	Estillville	Virginia..... Kentucky.... Tennessee....	82° 30′-83°	36° 30′-37°	957	25
13	Fredericksburg ..	Maryland.... Virginia.....	77°-77° 30′	38°-38° 30′	938	25

The geologists and topographers alternate in their work between field and office, spending about half the year out-doors, and the other half indoors. Just now (May 1, 1895) all is bustling activity of preparation, and parties are starting afield for a six months' outing. The final drawing and lettering of the maps surveyed last year, thirty-nine in number, are completed (and twenty-three are partially completed), and the completed maps now pass on to the editor for examination, criticism, and approval, and then go to the engraver, while the topographers return to the field for new material. Meanwhile the engraving and map-printing division of the Survey, composed of about forty persons, go steadily forward with the engraving and printing, producing about six new topographical sheets per month. The engraving division also corrects the plates, and prints new editions of old maps as needed. At the same time, work on the geological folios is steadily getting into better condition, as the various questions incident to the beginning arise and are adjusted.

The appropriations for the ensuing year are the measure, in general terms, of the results anticipated. For the coming year the total amount is £103,000, an increase of £4000 over the current year.

In addition to this, there is one more grant of money of some importance, and which may materially influence the future of the Geological Survey. The United States for about eighty years has been surveying out, or perhaps I should say, staking out its domain and selling to settlers. It has parcelled out its lands into squares of one mile each, called sections, and these again into quarter-sections of 160 acres each. This subdividing, which need not be here described, has been hitherto done by contract. But this year a change has been ordered by Congress, and the Geological Survey has been charged with the task of making subdivisional surveys. For this purpose a grant of £40,000 has been made, and work has been already begun. Topographical surveys are to be carried on in connection with these subdivisional surveys, and improved results at lessened cost are predicted and being striven for. Should these better results be secured, the future work of the U.S. Geological Survey will be profoundly affected.

THE INDUS-DELTA COUNTRY.*—REVIEW.

By Major-General Sir F. J. GOLDSMID, K.C.S.I., C.B.

IN his preface to the memoir on the ancient geography and history of the Indus-Delta country—part of which is the reprint of a prior treatise —General Haig explains his purpose to be the supply of a "rough guide for those in Sindh who, taking an interest in the past of a province, one of the poorest and, in its outward aspect, the least lovely in India, care to seek out the relics of former ages, and trace for themselves some picture of the country as it was at different periods of its generally troubled history." The object is praiseworthy and promising; but it is to be apprehended that the chosen theme is one calculated to occupy classical students and geographers at home, rather than the majority of civil and military officers, and other public servants of our Indian Empire, even those whose lot it may be to labour in Sindh itself. It is most unlikely that the kind of book-references required for prosecuting an inquiry of this nature should be found in the bungalows or tents of Government *employés* between Bhawalpur and Karachi; or, indeed, in any private libraries throughout India, save those of high officials, who are by no means abundant in the Delta of the Lower Indus. Pocket editions of classical authors, or detached portions of the works of early geographers and historians, might be made available for the holster and haversack, but a quarto of Dean Vincent would be an almost impossible *vade mecum.*

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* 'The Indus Delta Country.' A Memoir chiefly on its Ancient Geography and History. By Major-General M. R. Haig, M.R.A.S. With Three Maps. (Kegan Paul & Co., 1894.)

Dividing his inquiry into nine heads and an appendix, General Haig puts before the reader (1) a sketch of the geography and hydrography of the Delta country, as now understood; (2) the Delta at the time of Alexander's expedition, with one sketch-map of a supposititious Karachi coast, and another of Patalene, showing the coast-line 8 miles within that of the present day; (3) the Delta according to later Greek accounts, with a map giving the respective positions of Karáchi, Tatta, Haidarabad, Lakpat, and Umarkot. Then follow six more historical or semi-historical chapters, bringing the *status* down to "Lower Sindh in the modern period," or practically to the British conquest in 1842. The author's treatment of the intricate question of river changes is ingenious and indicative of careful study, involving the exercise of archæological as well as engineering research, irrespective of personal acquaintance with the local geography. But the details are too minute and complicated for more than a partial notice in these pages, and we shall confine our comments upon them to attempts at identifying places mentioned by old classical writers with known modern sites. Perhaps there is no more perplexing field of inquiry for the historical student than that in which nomenclature is the main component. Similarity of sound is so misleading to the many; and even the philologist may be at fault in his tests, though he apply them under recognized and mathematically true principles.

It will be sufficient for present purposes to glance at Appendix F, headed "The Voyage of Nearchus from Alexander's Haven to the Mouth of the Arabius," the following extracts from which comprehend much of the line of argument taken up in the text:—

(1) "As to the position of Alexander's Haven, I imagine it to be indisputable that it was somewhere in Karāchī *Bay*, though probably not in that part of it now called Karāchī *Harbour*. Something depends on the identification proposed for *Krokala*. I think Colonel Holdich attributes too much importance to the resemblance between the names *Krokala* and *Kakrālā*. It is not at all unlikely that the sandy isle was called *Kakrālā*, and that the Greeks turned this into *Krokala*.

(2) "*Sakala* may be placed, I think, a little east of *Bidok Lak*. From *Saranga* (say a few miles north of the *Hab* mouth) to this spot the distance would be 24 miles, and, though the length of the run is not stated in the narrative, we have other means of knowing . . . that it must have

been reckoned at 220 *stadia*. . . . Between *Saranga* and *Sakala* the fleet must have passed an island, though the fact is not mentioned. This was *Gadānī*, now a part of the mainland. I would identify Ptolemy's *κοδάνη*, on the Gedrosian coast, with *Gadānī*, which is described in the Memoirs of the Geological Survey as 'the most conspicuous hill on the coast,' and as 'peculiarly white in colour,' so that it would be likely to attract the attention of passing navigators. In point of distance from preceding anchorages, the position assigned by Colonel Holdich to Morontobara suits very well. I make it about 27 miles from Bidok Lak, and in the narrative it is said to be 300 *stadia*. It is not certain, but probable, that the 70 *stadia* stated to be the length of the inshore channel by which the sea was reached, are included in this reckoning.

(3) "The position of *Morontobara* requires, I think, further consideration. . . . Colonel Holdich's opinion that the estimate of runs between Cape Monze and Morontobara (as identified by him) are excessive, can hardly now be maintained. . . . From the shortness of the runs for the first week after leaving Alexander's Haven, it is most probable that in this part of its course the fleet had to depend on its oars alone. . . . It is in the account of the eight days' run (from Pagala to Kabana) that we first find mention of wind. . . . It is probable that sails were hoisted for the first time during the run from Pagala. . . . The anchorage for the evening at Kabana was but for a short time; . . . at midnight the fleet weighed again and ran (probably under sail) 200 *stadia* to Kokala. These runs were no doubt immensely over-estimated, as was also the next one (to the Tomerus)—put at 500 *stadia*—as well as that following (to Malana), stated to be 300 *stadia*."

In reference to the first extract, General Haig seems fairly to have established the likelihood of his proposition that the fleet of Nearchus, after sailing a winding course along the coast, and anchoring at a sandy island called Krokala, did, immediately on leaving Krokala, pass through a creek to Alexander's Haven—the two points named being at no distance apart. With regard to the remaining extracts, some of the places mentioned will be found in ordinary maps of India and the Mekran coast. Mr. Curzon's map of Persia, for example, contains one "Gadani." But there is something more to be said about the localities in question than obtained from classical or standard authorities.

More than thirty years ago the present writer was commissioned by the Bombay Government to proceed by land from Karāchī to Gwadar, with the view of certifying how far the Mekran coast route could be made available as a section of the overland telegraph-line then in contemplation for connecting the Indian with the European system. Accompanied by an escort of Sind Horse, under an English officer, and an assistant surgeon of the same force, he carried out the objects with which he was entrusted, and returned by sea to Karachi after an absence of eight weeks. The diaries of the mission were subsequently reproduced, in a somewhat modified form, in a paper read before the Royal Geographical Society on March 21, 1863, and contained in vol. vii. of the *Proceedings*. But in the report prepared for the Bombay Government, one of the points selected for separate consideration had been "the identification of particular places with reference to ancient geography and prior narratives;" and the information embodied under this particular head was not included in the geographical paper. A few brief extracts from the section of the official report which treated of these matters (heretofore unpublished) may now be given as bearing upon the subject of General Haig's memoir:—

"In seeking to identify the places now found on the Mekran coast with those mentioned by Arrian and the geographers Strabo and Ptolemy, it has occurred to me that we should make such names as have remained unaltered for a period of at least seventeen hundred years, the basis of practical inquiry. Of these are Malan and Kalmut. That the first is the 'Malana' and the second the 'Kalama' of the historian there can be but little doubt, and from their relative positions with respect to these two points, I would at once recognize Kokala as Koocheri, the Tomerus as the Hingor, Bagasira as Ormara, and Koppah as Kophas. . . . Whatever doubts may exist on the precise localities of Krokala, Morontobara, Sangada, and the harbours, tracts of land, or towns discovered by Nearchus or Alexander between the mouths of the Indus and Sonmiani, I think we may readily concur with Dr. Vincent* in many of the deductions resulting from his researches on the coasts of the Oritæ and Ichthyophagi. Of Kokala, the Tomerus, Bagasira, and Kophas, the limited information then at his disposal enabled him to detect the modern name of the first one only, but he seldom fails to find the true position of which he is in quest. He is somewhat uncertain as to Pagana and Kabana; and though the locality intended must be generally evident to those who have visited and studied the coast route to Hinglaj, it is difficult for any one to assert a nominal identification. The surmise that Kokala is Koocheri appears to be correct. It forms a bay to the eastward which would be welcomed by boats in stormy weather, and thus corresponds with the account given by Arrian. The 'Tomerus' must be the Hingor. . . . This river is one of the most remarkable in Mekran, and rises far to the north in the Kelat state. . . . It is often written the 'Aghor,' but I take that name to apply only to the halting-place of the Hinglaj pilgrims before reaching the immediate scene of the ceremonies to be performed. . . . The distance of the Tomerus from the Malan is set down at 300 stadia. Dr. Vincent computes that 16⅔ stadia equal an English mile. I know no better authority on such matters; and reckoning in accordance with this table, or from the mouth of the Hingor to the nearest point of Ras Malan, we should find the sailing route to be as stated, or about 19 miles. . . . I would venture a passing observation that the word Ormára, or Oromára, savours of Portuguese origin. The only name in which I can trace its possible root amid ancient annals is 'Ora,' a supposed town of the Oritæ, which D'Anville places under the name of 'Haur,' on the Tomerus. It is not unlikely that the learned Frenchman may have misapprehended a term which is used for *all* Mekran rivers at their junction with the sea. . . . 'Khor Hingor' is pronounced by the Baluchis 'Haur Hingor,' the sound of *k* being lost as in Turkish, when united in one double letter to *h*."

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* 'The Commerce and Navigation of the Ancients in the Indian Ocean.' By the Dean of Westminster. 1807.

To follow the report further would bring us far westward of General Haig's localities. In now taking leave of this interesting volume, we may note that it will not only be welcome, but suggestive to many inquirers.

TEMPERATURES OF EUROPEAN RIVERS.

By H. N. DICKSON.

It seems almost inexplicable that, although important information is to be expected, and has indeed in many cases been obtained, from observations of river-temperatures, there is still only a small fraction of the meteorological stations situated on river-banks which makes the recording of this element part of the ordinary routine. In a paper published recently by the University Geographical Institute of Vienna, Dr. Adolf E. Forster has collected most of the records of temperatures of European rivers which cover a long enough period to make them really useful, and the data are discussed with striking ability after the statistical methods still in most frequent use in this country. Each record is first criticized and valued on its own merits, the probable errors involved in different observational methods are discussed, and an attempt is made to reduce observations made at different hours to a true daily mean. Dr. Forster advocates the use of thermometers whose bulbs are inclosed in a badly conducting material like wax, the method of observation being to leave the thermometer immersed for a long time to take the temperature of the water. While this undoubtedly avoids the risk of great changes between the withdrawal of the instrument from the water and the time of its reading being made, it is difficult to see why the bath-thermometer ordinarily used for surface observations at sea should not serve the purpose equally well, and the need for long attendance while the thermometer is immersed is a distinct disadvantage. The material available for ascertaining the form of the daily curve of temperature is extremely scanty, the most extensive hourly record being that of M. Renou in the Loire at Vendôme. The usual diurnal course seems to be a minimum at 8 a.m. in winter and 7 a.m. in summer, a maximum at 3 p.m. all the year round, the mean being crossed between 11 a.m. and noon. From the discussion of other changes described later, we should expect sharpening and flattening of the points of inflection under different conditions, just as these are indicated in warm and cold currents in the ocean, but there are as yet no observations to show this. For a daily mean, however, single observations at 11 a.m., or two at 7 a.m. and 3 p.m., can leave little residual error. Observations at the two last-named hours give differences closely representing the daily range, and these exist for a considerable number of stations. The average range, as well as the mean variability, shows that in all cases the temperature of a river is in the first place controlled by that of the atmosphere, and this view is confirmed by the monthly and annual changes. Other factors—radiation, cloudiness, rainfall, evaporation, friction, thermal conductivity, heat capacity, etc.—are not without influence; but the most important is, as stated by Hertzer, certainly the temperature of the air. Dr. Forster's investigations show this with special clearness, as he deals chiefly with the larger rivers. The less important elements could probably be better studied from observations on smaller rivers, such as those recently discussed by Dr. Guppy, whose paper Dr. Forster has apparently not seen.

Following this line, Dr. Forster devotes the main part of his paper to the relations between the temperatures of air and water at different seasons, and classifies the difference curves into four distinct types—rivers flowing from glaciers, from lakes, from springs and mountains, and rivers flowing through plains. Glacier streams, like the Rhine at Rheineck, the Inn at Fiefenbach, the Sill at Innsbruck, or the Rhone at St. Maurice, are markedly warmer than the air in winter, and colder in summer, the temperatures being equal about April and October. The defect in summer is usually sufficient to make the annual mean of the water at least 1·8° Fahr. below that of the air. To what distance the glacier influence may make itself felt depends, of course, upon circumstances: on the Rhone it is distinctly recognizable 84 miles from the glacier, and on the Rhine 99 miles. Rivers flowing from lakes show a differential curve of a curiously characteristic type, strongly marked in the Rhone at Geneva, the Rhine at Alt-Briesach, the Ticino at Pavia, and the Mälar at Stockholm. In this case the mean annual temperature of the water is always above that of the air, the water being the warmer during the winter half-year to a much greater extent than it is the colder during summer. The outflowing water, in fact, closely follows the temperature of the surface layers of the lake, which remains relatively high during winter, inasmuch as the supply entering the lake from mountain and glacier streams, being colder than the main body, is denser and goes to the bottom, floating the warmer water up towards the surface. The Lake of Geneva and the Lake of Constance, for example, form in this way a kind of heat-distributor, which tends to prevent the formation of ice in the Rhone and the Rhine. In the Rhine the lake influence is distinctly marked at Kehl, and even as far as Speyer; but in the Rhone the effect is neutralized by the rapid fall and the glacier-waters of the Arve before Lyons is reached.

Streams derived from springs have the peculiarity that the water cools faster with low air-temperatures than it warms with high, chiefly because the water is kept at a low temperature by the soil, and by melting snow and ice. This characteristic, however, seldom persists for any great distance from the source. In mountain streams, which give a nearly similar curve, the greater slope of the bed and the frequent occurrence of deep narrow valleys, protecting from radiation, make the typical form recognizable further than usually happens where the spring influence acts alone, and the transition to the last or plain type of curve is delayed. The distinguishing feature of rivers of the plains is that their waters have a higher mean temperature than the air in all months of the year; and such rivers can be further classified in three divisions—according as the excess is in summer greater than in winter, is equal in both seasons, or is in summer less than in winter. The first includes the true rivers of the plain—the Elbe, the Saale, the Weser, the Loire, the Seine, the Marne, and the Thames; the second rivers, which, so far as has been observed, do not quite get rid of the marks of origin in mountain springs—the Vistula, the Warthe, the Zilligerbach, the Main, the Danube (Dillingen), the Egge, the Lech, and the Wien; while the third is simply an intermediate form, represented by the Oder, the Moldau, the Schloitzbach, and perhaps the Saône. It is obvious that the tendency must always be for all types to degenerate into the first division of the last, becoming gradually rivers of the plain. As Dr. Forster points out, there are probably really two forms of this type—that just noticed, where the water is always warmer than the air, and another where it is always colder. The latter form must be confined to countries where protracted frosts do not occur, and we have no example of it in Central Europe.

Space does not admit of even a summary of Dr. Forster's extremely interesting discussion of the inflections of the annual curves of water-temperature or of the variability of that element at different seasons. An important extension is given to Captain Meyer and Mr. Bubendey's recent investigations on the distribution of temperature of rivers before and during the formation of ice, and the final section deals with the conclusions of Rankine, Hertzer, Ule, Keller, and others, with respect to the temperature effects of friction, suspended matter, soil drainage, waterfalls, etc.; all of which, it must be admitted, demand further observation. Dr. Forster's paper is an extremely suggestive contribution to physical geography, and his results should lead to a great increase of interest in the subject.

A NEW ESTIMATION OF THE MEAN DEPTH OF THE OCEANS.

ALTHOUGH Humboldt, in 1843, attempted to estimate the mean height of the continents, and Peschel, in 1868, computed the average depth of the Atlantic Ocean, it may be said that the first serious calculation of this kind, made with anything like adequate data, is that by Krümmel in 1878. Krümmel divided the open oceans into five-degree squares, and the enclosed seas into one-degree squares, computing the mean depth of each square as nearly as was possible with existing soundings, and obtained for the waters of the globe a mean depth of 1880 fathoms, which he corrected later to 1815 fathoms. In 1883 De Lapparent published the results of an investigation based on measurements of the contour-lines given in Stieler's Atlas for every 1000 metres. The area of each layer 1000 metres in thickness was taken as the mean of the area of its upper and lower contours, and the final result gave a mean depth of 2330 fathoms. Next followed Dr. John Murray's work, published in 1888. This was founded on measurements of contour-lines for every 500 fathoms, made with the planimeter from maps by Bartholomew. Each layer was divided into a prism whose cross-section was the area of the lower contour-line, and a quoit-shaped surrounding ring of triangular section, the horizontal distance between the two contours forming the base of the triangle. The ring was treated as a prism the area of whose base was the difference between the areas of the contour-lines, and whose height varied from one-half to two-thirds of the vertical distance between the contours. The mean depth for all the oceans obtained in this manner was 2076 fathoms. Using Murray's data, but taking the height of the surrounding ring as half the vertical distance between the contours throughout, Supan obtained a mean depth of 1996 fathoms. Penck almost at the same time introduced a graphic method, by applying which to Murray's data he obtained the same result as Supan. In 1889 von Tillo, employing Bartholomew's maps in a somewhat different way from Murray, obtained almost exactly Murray's result. Lastly, Heiderich, in 1891, returned to the method originally employed by Humboldt, and from measurements of vertical profiles drawn for every five degrees of latitude gave the mean depth of the oceans at 1880 fathoms, Krümmel's earlier value.

In a recent paper Dr. Karl Karsten has criticized each of the above methods in some detail, both from a theoretical point of view and by practical application to a test case. All determinations depending on planimeter measurements are, of course, subject to the considerable errors unavoidable in using that instrument, and in the work of Murray, Supan, and von Tillo, a further uncertainty is introduced by the more or less arbitrary assumptions which have to be made in calculating the volumes of the quoit-shaped rings. This second difficulty is to some extent got over by the graphic method of Penck, in which a series of points, whose ordinates are proportional to the depths below the surface, and abscissæ to the areas of the contour-lines at the corresponding depths, are joined by a curve, and the area of the curve measured by the planimeter. But none of the planimetric methods are free from a third source of error, due to the comparatively wide vertical intervals between the lines of measurement. With measurements every 500 fathoms, for example, a depression inside a closed 500-fathom line might go down to 550 fathoms or to 950, and the estimated volume of water contained would be the same.

Heiderich's method of profiles is free from many of the objections to which measurements of contour-lines are subject; but there remains the case analogous to that just mentioned, the great distance between the parallel profiles. Any attempt to improve either method by increasing the number of contour-lines or of profiles virtually converts it into Krümmel's method of estimating the volume of prisms of equal cross-section, by averaging all the available soundings for each square and thereby arriving at the mean depth—a method which has the advantage of being independent of the scale of any map employed, and of being applicable with greater or less degrees of refinement as the locality under investigation seems to require.

Applying the various methods to an area, the depths of which have been fully explored, Dr. Karsten obtains the following results for the Carribbean and Gulf of Mexico:—

	Carribbean Sea.		
	Northern half.	Southern half.	Gulf of Mexico.
Murray and v. Tillo ...	1488 fathoms	1498 fathoms	855 fathoms
Hiederich's formula I.	1421 „	1433 „	803 „
„ „ II.	1408 „	1418 „	822 „
Penck	1426 „	1426 „	841 „
Method of squares ...	1374 „	1456 „	851 „

Here Murray and von Tillo's methods are combined by assuming in both cases that the volume of the quoit-shaped rings is equal to the product of the base by two-thirds of the height; Hiederich's first formula treats the layers as prisms whose vertical section is a trapezium, and the second formula as conical frusta. The last line is calculated from measurements of one-degree squares. Dr. Karsten finds that the superficies of the whole area obtained by the planimeter differs from that given by the measurement of squares by about three per cent., while his result by the latter method agrees with that of Krümmel to within 0·035 per cent. The planimeter measurements were repeated at least five and sometimes more than ten times, and their inconsistencies, combined with the fact that large-scale charts could not be employed, quite account for the large differences. Larger differences occur in the volumes and mean depths; Murray and von Tillo's method gives for the southern part of the Carribbean Sea nearly 8 per cent. more than the method of squares, from which it would seem that the fraction two-thirds gives too high a result for the volume of the quoit rings. Heiderich's formulæ naturally give lower results, but in the Gulf of Mexico a marked improvement is noticeable with the second formula, which treats the bottom layer as bowl-shaped instead of conical—making a difference of 22 fathoms in the mean depth. Penck's graphic method, as well as the others, suffers from not taking account of the numerous irregularities in the relief of the bottom.

Having made out a case for Krümmel's original method in the manner indicated, Dr. Karsten has recalculated the mean depth of each five-degree square in the open oceans, and of each one-degree square in the smaller seas and enclosed basins. The values for each square are given in his paper in detail, and the general results are summed up in a table, from which we extract the following:—

	Mean depth, fathoms.	Area, square miles.	Volume. cubic miles.
Atlantic Ocean with Arctic ...	1728	39,690,091	77,966,975
Indian Ocean	1965	28,598,860	63,855,433
Pacific	2094	67,768,210	161,260,106
Antarctic	820	6,037,313	5,628,376
Total	1912	142,094,474	308,710,890

We may draw attention to a misprint on p. 27, which makes the area of the Atlantic 102,755,679 square kilometres, instead of 102,753,679.

THE SIXTH INTERNATIONAL GEOGRAPHICAL CONGRESS.

PROBABLY most of the Fellows of the Society are already familiar with the main course of events during the Congress, but as it has already become to some extent a matter of history, we may now be better able to form some estimate of its net result. In the first place, it is our pleasant duty, as the hosts of the foreign Delegates and Representatives, to express our appreciation of the cordial manner in which they entered into all the arrangements which had been made, thereby reducing the burden laid upon the Committee to a minimum, and contributing an indispensable factor to the success of the meeting. In geographical science, as in many other things, our methods in this country tend to become insular, and we accordingly derive all the greater benefit and stimulus when the leaders of geographical thought on the Continent and in America come and give us of their best.

The leading principles which guided the arrangements of the Congress have already been explained in the *Journal*, and in practical work they have not been found wanting. The foremost place was invariably given to the deliberative meetings, and the small number of separate sections prevented anything like degeneration into mere technical discussion of details. At the same time, the exhibitions were by no means neglected, nor were the various social gatherings felt to be unduly burdensome after the labours of the day.

The comparatively short time for which the space in the Imperial Institute was at the disposal of the Exhibition Committee before the actual opening of the Congress, put a somewhat severe strain on the Committee's resources; but, thanks to the zeal and energy of Mr. Ravenstein, the general secretary of the Exhibition, and Mr. Coles, with their devoted assistants, the arrangement and cataloguing of the objects exhibited, with a few exceptions, were completed in time. The foreign exhibits, the exhibits of learned societies, government departments, and private firms, were placed on the first and second floors of the east wing of the main building; the collection of paintings and photographs, under the charge of Mr. John Thomson, was arranged in the corridor of the first floor; while the loan historical collection and the instruments were disposed in an iron building specially erected in the south-west quadrangle, part of which was also occupied by exhibits of travellers' outfit and equipment. In the foreign section the countries chiefly represented were: Germany—a collective exhibition from the Berlin Geographical Society being arranged by Dr. Karl von den Steinen, President of the Society—Switzerland, France, Sweden, Norway, Denmark, the Netherlands, Belgium, Austria-Hungary, Italy, Portugal, Spain, Russia, Finland, the United States, and Mexico. The exhibits of these countries were almost exclusively modern, historical geography being restricted to Mr. Ravenstein's admirably arranged illustrations of the development of the art of cartography, and Mr. John Thomson's interesting series of portraits of eminent travellers, cartographers, and authors of geographical works. The chief public departments of the United Kingdom were well represented, as well as India, Canada, and South Africa. The general catalogue of the exhibition, although of modest proportions as such things go, is undoubtedly a document of permanent value, from both an historical and an educational point of view.

The Congress was formally constituted on the evening of Friday, July 26, by H.R.H. the Duke of York, one of the Honorary Presidents. The Delegates and Representatives of colonial and foreign governments and geographical societies were first presented to His Royal Highness, most of them by the Ambassadors or Ministers of their respective countries, and in the case of the Colonial Delegates by Lord Selborne, and thereafter the Duke of York addressed the whole Congress, extending to its members a cordial welcome on behalf of Her Majesty the Queen. Mr. Clements Markham, as President of the Royal Geographical Society, then welcomed the Congress on behalf of the geographical societies and geographers of the United Kingdom; and after Chief Justice Daly, the oldest President of a Geographical Society living, had replied in a short but most felicitous speech, the Congress adjourned to a reception in the gardens.

On Saturday morning the President delivered his opening address to a brilliant audience, and a letter of greeting to the Congress from His Majesty the King of the Belgians was read; also a telegram from the East Siberian section of the Russian Geographical Society, dated from Kiachta. Two sections met in the afternoon, one dealing with geographical education, and another with the applications of photography to surveying. In the former, papers by Professors Levasseur and Lehmann afforded British members of the Congress an opportunity of gaining insight into the methods of teaching geography common in France and Germany, with the result of exciting considerable sympathy with the appeals made by Messrs. Mackinder and Herbertson, and other teachers of the subject in this country, for improved methods in our schools and universities. A committee was appointed to draft a resolution commending these efforts to place geographical teaching on a better footing to those responsible for our educational interests. Photographic surveying naturally appealed to a smaller audience, but considerable interest was manifested in a combined camera and theodolite exhibited by M. Schrader, and in Colonel Stewart's "Panoram" for photographing the whole horizon, which was described and exhibited by Mr. Coles. In the evening a large number of foreign guests dined with the Geographical and Kosmos Clubs, "on the meridian," at Greenwich.

On Monday the general session of the Congress was devoted to polar exploration. The discussion on the Antarctic Regions centred round a paper by Dr. Neumayer, which briefly stated the case for a scientific expedition on an adequate scale, pointing out the additions to be expected in various branches of natural knowledge. Dr. Neumayer was supported by Sir Joseph Hooker, Dr. John Murray, Sir George Baden-Powell, General Greely, and Professor Guido Cora, and a committee was appointed to draw up a resolution. The subject of Arctic exploration was introduced in an interesting paper by Admiral Markham, who was followed by General Greely and others, and Herr Andrée unfolded his daring scheme for reaching the North Pole by means of balloons.

The sections, which met in the afternoon, were concerned with physical geography and geodesy. Papers were read on the Modification of the Normandy Coasts, and on the Periodic Variations of French Glaciers, by M. S. Lennier and Prince Roland Bonaparte respectively, and the question of the decimal division of time and angles gave rise to some animated discussion. In the geodesy section M. Charles Lallemand gave some account of the work of the French surveys, and papers were read on the geodetic work of the Indian and Cape of Good Hope Survey Departments.

On Tuesday the general meeting received reports on matters which had been held over from the Congress at Berne. The system of appointing committees at one Congress which had to maintain an independent existence as best they could until the constitution of the next, not having been found to work very satisfactorily, the Congress took the important step of resolving, on the motion of Professor Brückner, that the leading officials of each Congress shall retain their posts during the interval following. A kind of permanent commission is thus established, which will serve to keep the various committees together and assist them in carrying out their special duties. The commission appointed at Berne to consider Professor Penck's proposal that a map of the world on a scale of 1:1,000,000 should be constructed, submitted a report of its committee favourable to the scheme, and its recommendations were afterwards unanimously approved by the whole Congress. The commission was, on its own recommendation, merged in the permanent executive.

Tuesday's sectional meetings were occupied with oceanography and with geographical orthography and definitions. Professor Libbey's paper, on the Relations of the Gulf Stream and the Labrador Current, contained some interesting results bearing on the relations of oceanography to marine zoology. In the other section, Mr. Chisholm's paper on the spelling of place-names gave rise to some discussion, and a proposal that a resolution touching this difficult question should be drawn up and submitted to the Congress, was adopted.

Wednesday was the great field day on Tropical Africa, and the interest of the proceedings, so far as it can be judged by the attendance of members, attained its highest point. The question discussed was, "How far is Tropical Africa suited for development by white races?" and it was attacked from every possible side by Sir John Kirk, Count Pfeil, Mr. Stanley, Mr. Ravenstein, Mr. Silva White, M. Lionel Dècle, Colonel Slatin Pasha, Major Baker, Captain Hinde, M. J. Vincent, Dr. Bassaria, Captain Amaral, Dr. Sambon, Dr. Murie, and Mr. Louis. Later in the day a paper on the Mapping of Africa was read by General Chapman, and a resolution was proposed and referred to a committee. Mr. Silva White followed with a paper on his chrestographic map of Africa.

Only one section met in the afternoon, at which Professor Petterson's scheme for further international work in the North Sea was considered, and a paper on limnology by Dr. Mill was read.

On Thursday, Mr. C. E. Borchgrevink, who had been unable to reach England in time for the discussion on the Antarctic Regions on Monday, received an enthusiastic reception, and after he had read his paper, giving an account of the voyage of the *Antarctic*, the Congress offered him its congratulations on the results of his work. Professor Kan then read a paper on New Guinea, and Mr. Lindsay discussed future exploration in Australia. One of the sectional meetings was devoted to cartography, Professor Elisée Reclus reading a paper on a proposed terrestrial globe on the scale of 1 : 100,000. In the other section, Dr. Naumann compared the fundamental lines of Anatolia and Central Asia; and Mr. Henry G. Bryant gave an account of observations on the most northern Eskimo, chiefly made during the Peary Relief Expedition.

Friday's papers were of less general interest, although sufficiently important to specialists. The general session dealt chiefly with ancient maps, a paper by Baron Nordenskiold being presented by the President. Towards the end of the meeting, M. Batalha Reis made an interesting announcement of the discovery of an authentic portrait of Prince Henry the Navigator at Lisbon. The sections heard papers on speleology and mountain structure, and on the morphology of the Earth. The audiences at all the meetings showed that many members evidently regarded this as the "off-day," and had gone to study geography practically elsewhere.

On Saturday only one paper was read, by General Anneukoff on the importance of geography in the present agricultural economical crisis. The resolutions drawn up by the various committees or submitted by private individuals were then put to the meeting, and after the usual reports and votes of thanks, the President delivered a short concluding address and dissolved the Congress.

Such, in barest outline, is the record of proceedings. We have already alluded to the harmony and cordiality which prevailed throughout, but we cannot refrain from specially recording the graceful act of international courtesy performed by the American delegates in supporting the motion that the Congress should accept the invitation of the Berlin Geographical Society to hold its next meeting in Berlin in 1899. A cordial invitation to Washington had been received from the National Geographical Society, supported by the United States Government, but there was a general feeling that the time was not yet ripe for a meeting on the other side of the Atlantic.

And the work of the Congress is not all "proceedings." We take it that one of the chief functions of such a body is to produce "transactions" in the form of distinct findings which shall represent the state of expert opinion on the most important matters coming within its province. Such findings will enable the private individual to ascertain, not only what problems are most urgently in need of solution, but also what methods are considered the best in dealing with them. In this respect the Geographical Congress cannot be said to have come short. We have already referred to the resolutions adopted with reference to Antarctic exploration, to the mapping of Africa, to geographical education in this country, and to the mapping of the world on a scale of 1 : 1,000,000. We may further notice some of the resolutions passed at the final meeting on Saturday, recommending further international co-operation in the physical survey of the North Sea, the organization of a uniform system of seismic observations, the explicit dating of all maps, and approving the principle of State printed registration of literature. On all these subjects, and on many others, the Congress, by large majorities, gave authoritative deliverance.

This Congress will be notable for two innovations tending to give the body a permanent constitution and to promote harmonious feeling among the different nationalities composing the Congress. The former object was accomplished by deciding, as has been stated, that the acting officials of each meeting shall hold office until the next meeting. For the first time also, we believe, an Advisory Committee was instituted at this meeting, consisting of the Vice-Presidents representing every nationality, to which all resolutions and other important matters were submitted before being brought before the general meeting of the Congress. This plan was found to answer excellently, and no doubt it will be continued at future meetings.

Extra meetings and demonstrations were reduced to the smallest number possible, but the few for which arrangements were made must not pass unnoticed. Miss A. M. Gregory gave demonstrations of her geodoscope, which was exhibited in the instrument section; and towards the end of the meeting Mr. W. B. Blaikie, of Edinburgh, explained the construction and use of his cosmosphere, an ingenious instrument for illustrating the facts of astronomical geography. On Monday evening Professor W. Libbey exhibited a large number of lantern slides made from photographs taken by himself in the north of Greenland, in the Sandwich Islands, and in many parts of America. Dr. Mill gave on Thursday evening a very successful demonstration of the advantages of working two lanterns simultaneously, in the form of a lecture on his surveying work in the English Lakes.

We cannot refrain from stating, in conclusion, that we have received spontaneous assurance from many influential quarters at home and abroad that the Sixth International Geographical Congress has been an almost unqualified success.

NEUMANN'S JOURNEY IN EAST AFRICA.*

Herr Oskar Neumann's expedition, the objects of which were mainly zoological, set out from Tanga on April 27, 1894. Beyond Mgera the route led to Trangi by the direct road through northern Nguru, which was followed by Dr. Fischer in 1885, but had not been since traversed. It passes through a region abounding in ostriches, zebras, gnus and other antelopes. The progress of the expedition was here opposed by the Kibaya, the most south-easterly tribe of the Masai, and it became necessary to repel them by force of arms. After an excursion from Irangi to Usagara, the expedition, 130 strong, started first, on September 20, for Mount Gurui, which the leader was the first European to ascend (October 11). The ascent presents no exceptional difficulties; one zone only, lying from 650 to 1300 feet below the summit, covered with a brushwood of ferns, azaleas, and rhododendrons, proved a serious obstacle. Even the extreme summit is clothed with a vegetation of Alpine flowers and short grass. Just below the top, a pair of the most elegant little antelopes (*Oreotragus saltatrix*) was observed. The peak has no crater, but in the plain there are two valleys trending from south-west to north-west, which show manifest traces of volcanic action, in the form of scoriæ and masses of pumice. Far away in the south-west an extensive natron swamp was to be seen, which, to all appearance, is double the size of the Sagarassa lake at the foot of Mount Gurui. In the beginning of November the expedition encamped in Umbugwe, on Lake Manyara. On the eastern shore of the lake hot sulphurous springs issue from the walls of the Umburru plateau, which attain a height of from 650 to 1000 feet. The lake is very strongly impregnated with natron, and so shallow that it is possible to wade in it for a distance of 2 or 3 miles from the shore. The bird fauna is very extensive. Thousands of pelicans and flamingos line the shores, countless flocks of plovers and sandpipers course along the margin, while geese and ducks are no less numerous; and with them may be seen grey and white herons, cormorants, ibises, marabu, and Yabiru storks and Balearic cranes.

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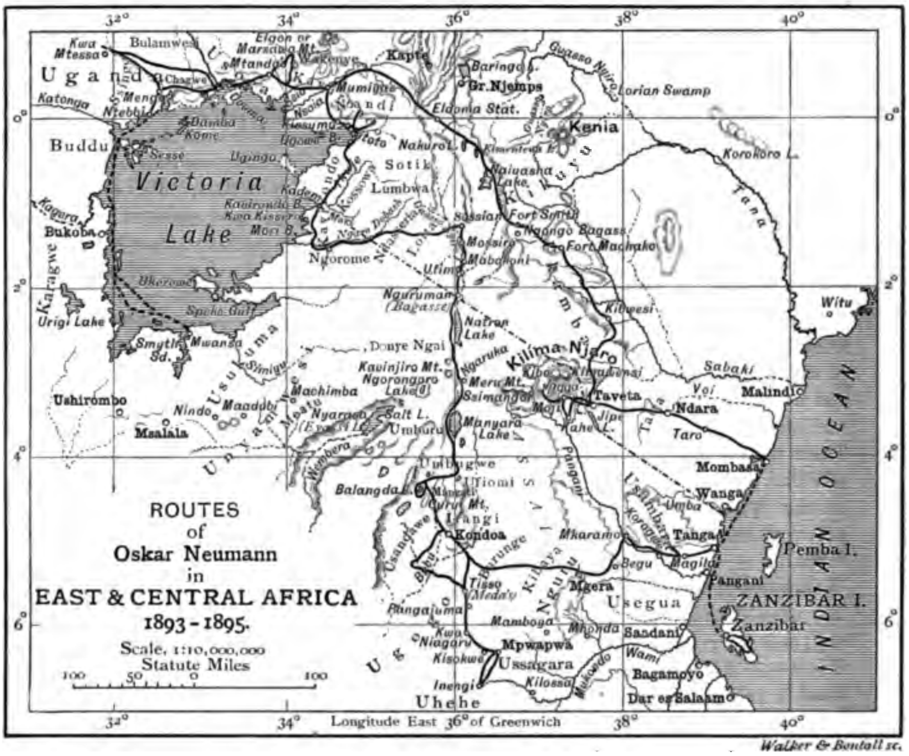
* Abstract of paper read at the Berlin Geographical Society.



Walker & Boutall sc.

From Ndalalani, on the west shore of the natron swamp of Nguruman, an attempt was made to ascend the Donye Ngai, which, however, was not entirely successful, owing to the extreme steepness and the crumbling nature of the upper lava-slopes, which were coated with natron. About 500 feet below the main summit a small active vent of steam was observed. According to the statements of the Masai, who dwelt in the vicinity, an eruption has taken place within the last decade. A famine was raging at Nguruman, at the north end of the natron lake, whence a friendly old Mkuafi offered himself as guide to Ngoroine. From Rangata Lungatun, south of Sossian, the difficult ascent to the Loita mountains was made. The road leads through an upland country, rising in terraces and intersected by many valleys, in which flowed streams fringed with high trees. The only traces of the Masai, who once lived here in large numbers, but were ruined by the cattle plague, consisted in numbers of broken-down huts made of branches, old mouldy skins, and skulls of cattle and human beings. Advancing westwards, the expedition came upon the Ngara Busse, which empties itself into the Ngaro Dobash, and, following this downwards, arrived at Ngoroine on January 28, 1894. The Wasegeyu of Ngorome are very friendly, but also very dirty people, much given to smoking tobacco and hemp, and living in large villages surrounded by candelabra euphorbias. North of the Ngaro Dobash (here called Mara), Uturi, one of the most southern districts of Kavirondo, begins. Proceeding northwards along the bay of Mori, the expedition, on reaching the sultan's village Kaden, on the bay of Kavirondo, was surrounded by many thousands of Wagaia warriors, and was only saved by hastily occupying and fortifying a village, and making daily sallies from it. The fight lasted nine days, after which the Wagaia of their own accord offered a truce, and celebrated the conclusion of peace with festivities. The Wakavirondo, or Wagaia, are a Nilotic tribe, who have only migrated here in recent years. Judging from their language, they are identical with the Shilluk, who dwell on the White Nile south of Khartum. The original inhabitants have been either driven back by them into the mountains of Nandi, Lumbwa, and Kossova, or have been hemmed into small enclaves like Mohuru, Utegi, etc. The new-comers are constantly pressing towards the south, and already extend their forays as far as Speke gulf, and in the land of Ururi there are no more Waruri, but all the inhabitants are Wagaia. Their powerful forms distinguish them from the people of Nandi and Lumbwa, who are nearly akin to the Wanderobbo, as well as from their Bantu neighbours to the north-west and south. Both men and women go completely naked. The warriors are painted black, white, and red, and carry large shields of buffalo-hide, and quite the longest spears in all Africa. Their houses are round, built of clay, and are kept very clean. They are very war-like, and if they are not engaged in a common war against Kossova, Lumbwa, or the Waseguyu of Mukenye and Ngorome, the small sultanates are at war amongst themselves. The journey was continued past Mhugu, Kwa Niadoto, Kwa Buosh, and Kwa Magambo to the mountains of Kossova. The villages of the Wakossova lie scattered over the mountains, each numbering five to twenty huts. The uncultivated parts of the land are covered with high grass. The people are shy, and very thievish. Many a Swahili ivory caravan has been massacred in Kossova. At Kwa Kitoto, on Ugowe bay, where there is a permanent camp of Swahili ivory traders, a long stay was again made, for the purpose of collecting. East African types of animals are already scarce here, while Abyssinian and typical West African species occur in almost equal numbers. Among the latter a bright-coloured monkey (*Cercopithecus neglectus*), hitherto found only on the White Nile and in French Congo, is especially worthy of mention.

From Mumiya the traveller proceeded to Uganda, in order to obtain permission from Colonel Colville to extend his journeys further into the British sphere. Usoga, which begins a few miles west of the Sio, is one vast banana grove. Unlike the Waganda, the Wasoga like to colour their bark-cloth grey and black. There is not a more thievish race in existence than the Wasoga. From Ntebbi, the head-quarters of the governor, Herr Neumann repaired first to Bukoba and Mwanza to replenish and complete his equipment, and then visited Northern Uganda, traversing the province of Chagwe, and on September 6 was on the river Maianya. Here the landscape is again typically East African, with bush and steppe, and accordingly quantities of game. Besides zebras, waterbuck, etc., the *tsunu*, a characteristic

Central African antelope, is very common. The elephant occurs in troops of some hundreds.

On the return to the coast, still another excursion was made in a north-north-east direction from Mtanda's, in the direction of Elgon, and after three days' march a broad stream with lake-like expansions was met with. The Wakenye, who are settled here, dwell in houses built on piles, which occur either singly or three or four together in the cypress thickets which fringe the stream. The house is round, and the floor consists apparently of planks covered with clay. It is raised from six inches to a foot above the surface of the water. In front of the houses is a floating mass (called tinka tinka by the Swahili), consisting of reeds, pieces of wood, and sedge, held together by the cypress growth. This tinka tinka, on which one can walk—constantly sinking in, it is true—serves the Wakenye as a courtyard, where they keep poultry and dogs, and occasionally even a sheep or a goat. They procure these, as well as the meal which they use, from the Wasoga and Wanyole in exchange for fish. Further to the north-east, in the direction of Elgon, the warlike Wadola are said to live, and to the north the Wakeddi.

On November 11, the expedition started for the coast from Mumiya's by the main Uganda track, which it left just beyond Kibwezi, and proceeded over the very volcanic Kyulu range to Kilimanjaro, whence Mombasa was reached on February 5.

The zoological collections yielded about 2500 insects of about 1000 species, about 100 species of crustacea, 50 species of molluscs, 250 fishes of 30 different species, 400 reptiles and amphibia of 90 species. Of birds about 600 species, represented by 2500 specimens, were brought back, and of mammals 275 specimens of 90 species, including five new to science.

THE MONTHLY RECORD.

EUROPE.

The Waterways of the Seine Basin.—In a Foreign Office report (Miscellaneous Series, No. 336) lately published (with maps), Mr. Consul O'Neill gives some interesting particulars respecting the fluvial traffic of the port of Rouen, and, generally, the part played by internal water-routes in the development of the trade of France, particularly in the Seine basin. At Rouen the fluvial side of the port, which is quite distinct from the maritime, possesses unusual importance, the distinguishing feature of the trade being its dependence upon the interior navigable waterways. This is shown by the fact that the latter take from the port more than five-eighths of all the goods brought to it by sea, the railways taking a very inferior share. Instances are given of the introduction into Central France of products of foreign countries by this means, although such products may exist in neighbouring parts of the country not possessing means of water-transport. Besides heavy raw materials unable to support railway rates, there is a large distribution of agricultural and chemical products, groceries, wines, petroleum, etc., from Rouen by the water-routes, and industries have often been enormously developed by the cutting of canals through certain districts. The waterways of France are most naturally grouped according to the four main river-basins, but of these the Seine shows a great superiority, due, according to Mr. O'Neill, to the steadiness of its water-supply throughout the year, and also to the facilities which there exist for connection with other countries. The waterways of the Seine basin, and those in immediate connection with it, are divided, for statistical purposes, by the Department of Public Works into seven main divisions, and a clear analysis of the traffic for these lines is given in the returns published by the French Government. After first glancing at the international traffic by canal between France, Belgium, and Germany, Mr. O'Neill enters into particulars respecting the most important of these interior lines, paying special regard to the nature of the traffic they carry, and to the industrial, agricultural, and commercial interests they serve. Over the "northern line" from Paris to the Belgian frontier, coal is the chief amongst the goods carried. The branches of the Canal des Ardennes form links in a direct route south to the eastern departments, and the traffic is principally made up of goods in transit. Of the waterways which unite the English channel with the Mediterranean, the Canal de Bourgogne is less used than by way of the Bourbonnais, partly because of the decline of the steam industries of the country through which it passes, partly on account of the greater elevation over which it is carried. The Canal de l'Est and the Canal de la Marne au Rhin possess a great importance through the facilities which they give for the transport of coal to the district of Nancy. In the competition between the northern maritime ports for the trade of this district, Rouen takes the largest share of the canal traffic. Finally, the Seine from Paris to Rouen and the sea is the most important waterway in France, both for extent of traffic and facilities of navigation.

ASIA.

The Pamir Commission.—The Delimitation Commission now engaged on the Pamirs arises out of clause 2 of the Anglo-Russian agreement, recorded in Lord Kimberley's letter to M. de Staal of March 11th last (*Parliamentary Paper,* Treaty Series, No. 8 of 1895). The clause referred to provides that a joint Commission of a "purely technical character," with a small military escort, shall mark out the exact run of the line between the spheres of influence of the two empires east of Lake Victoria (Zor Kul). This line (so runs the wording of the agreement), "starting from a point on that lake near to its eastern extremity, shall follow the crests of the mountain range running somewhat to the south of the latitude of the lake as far as the Bendersky and Orta-Bel passes. From thence the line shall run along the same range while it remains to the south of the latitude of the said lake. On reaching that latitude, it shall descend a spur of the range towards Kizil Rabat, on the Aksu river, if that locality is found not to be north of the latitude of Lake Victoria, and from thence it shall be prolonged in an easterly direction so as to meet the Chinese frontier. If it is found that Kizil Rabat is situated to the north of the latitude of Lake Victoria, the line of demarcation shall be drawn to the nearest convenient point on the Aksu river south of that latitude, and from thence prolonged as aforesaid." The Amir of Afghanistan is to be represented on the Commission, and the latter body is to collect data as to the Chinese frontier, so as "to enable the two governments to come to an agreement with the Chinese government as to the limits of Chinese territory in the vicinity of the line." Clause 4 provides that the British and Russian governments, respectively, abstain from exercising any political influence or control, the former to the north and the latter to the south of the above line of demarcation, while the British government on its side engages (clause 5) that the intermediate territory between the Hindu Kush and the new line east of Lake Victoria shall not be annexed to Great Britain, and that no military posts or forts shall be established in it. Further, there is an important clause towards the end of the agreement, recording that the execution of the agreement is contingent upon the evacuation by the Amir of Afghanistan of all the territories occupied by the latter on the right of the Punjab, and on the evacuation by the Amir of Bokhara of the part of Darwaz south of the Oxus. It will be observed that this agreement is practically a settlement for good of the international frontier difficulty. The area of territory ceded by Afghanistan north of the Oxus is far larger than the corresponding territory south of that river, to be given up by the Amir of Bokhara. On the other hand, the arrangement of the line east of Lake Victoria is a distinct gain for Great Britain, as it shuts out all possibility of the Russian outposts coming down southward and threatening the passes leading over the Hindu Kush. The wording of clause 5, however, while it concedes this strip of country to the Amir, debars his Highness apparently from erecting forts in that portion of his own territory. With regard to the delimitation of the Chinese frontier, the agreement wisely recognizes the fact that this is a matter which concerns England as well as Russia, and provides that the agreement with China over this point shall be undertaken by both governments. On the whole the frontier arrangement may be pronounced to be satisfactory, and calculated to bring about a permanent settlement of this long-standing difficulty. The *personnel* of the British section of the Commission consists of Colonel Gerard, Central India Horse, commissioner-in-chief; Colonel T. H. Holdich, C.B., and Major Wahab, survey officers; Surgeon Captain Alcock and Captain McSwiney in charge of the camp, and a small escort of Pathan-speaking men of the 20th Punjab Infantry. The route taken by the members of the Commission was by way of Gilgit, Yasin, and the Darkot pass. It is expected that the demarcation will be finished by the end of August.

Tibeto-Sikkim Boundary Commission.—Another joint international boundary Commission has been charged to demarcate by means of boundary pillars the run of the Sikkim frontier. The object is to prevent the occurrence of local disputes, the exact line in some places, especially on the passes, being difficult to determine. The British part of the Commission, consisting of Mr. White, accompanied by Captain Pressey and Dr. Ewens, with an escort of about forty men of the 4th Bengal Infantry, met the Chinese representative, Major Tu Hsi, and his suite at noon on May 18, on the summit of the Jelap pass, at an elevation of 14,700 feet. With the Chinese envoy are an English-speaking and a Tibetan-speaking assistant. As soon as the weather proved favourable, it was the intention of the Commission to erect pillars on the Bhutan side, where the Gipmochi peak is the most striking feature of the landscape. Having completed demarcation here, the Commission propose to retrace their steps and proceed almost due northward, where the country is still more mountainous, the very passes here being 16,000 and 17,000 feet above sea-level. It is anticipated that the whole of the summer will be occupied in demarcation, the party eventually working round to the sources of the Teesta and its affluents. The Chinese, it is said, are loyally helping the British; but the Tibetans are obstructive, and actually pulled down the pillar erected on the Jelap La Pass. A detachment of the Manchester regiment is stationed at Gnatong. The most recent news is that the opposition of the Tibetans has necessitated the abandonment of the work of the Commission.

M. Dutreuil de Rhins' Journey in Central Asia.—Previous notices of this journey having been somewhat vague and fragmentary, the connected account given by M. Grenard, the companion of the unfortunate leader of the expedition, before the Paris Geographical Society, is of considerable interest (*Comptes Rendus*, 1895, pp. 228 *et seq.*). Leaving Paris in February, 1891, the travellers proceeded *viâ* Osh and Kashgar to Khotan, the starting-point of exploration proper. The first season's work (eventually spread over the second also) consisted of an exploration of the mountains south of Khotan and Keria, the routes of M. de Rhins differing considerably from those of previous travellers (Carey, Pevtsof, etc.). M. Grenard gives the name Altyn Tagh to the whole of the outer range which bounds the Tarim basin on the south, and parallel with this to the south he places a second continuous range, called Ustun Tagh, which has a higher elevation, but less sharp outlines. The ranges, where crossed, are entirely devoid of living beings. The most important part of the journey began in the third season (1893), when the explorers moved on to Cherchen, and, having obtained a supply of camels, decided to traverse the mountains south of that place, in which direction a wholly unexplored tract lay before them, the routes of Prjevalsky, Carey, and Bonvalot, lying considerably to the east, while Pevtsof's expedition had here merely skirted the range. The pass over the Altyn Tagh proved unusually easy, the range there spreading out into several branches, and displaying gentler slopes and more open valleys than elsewhere. The second range, here known as Arka Tagh (Akka Tagh of the Society's map of Tibet), was reached near the source of the Kara-Muren river. The route led into a chaos of mountains, absolutely arid and barren, without a blade of grass or the trace of a single animal. The main ridge was crossed at a height of 18,800 feet. Further east, a magnificent group of snowy mountains reached a height of 25,000 feet. A salt lake 25 miles long was passed, surrounded by mountains of a vivid red-brick colour. Beyond this game was met with, the hills becoming smaller, and the valleys producing a short, poor grass, and traces of a Tibetan encampment, probably of hunters, were seen. More high ranges were crossed under the blast of a freezing wind, and turning more to the south-west towards the position assigned on the maps to Thok-Daurakpa, the travellers reached lower altitudes and once more saw traces of inhabitants. Hence for some distance in an easterly direction the route almost coincided with that of Captain Bower, but kept to the north of the lakes Chargut-tso and Garing-tso, and the travellers passed the point at which the English explorer was turned back, pushing on as far as Lake Nam-tso (Tengri Nor), the vicinity of which they carefully explored. Here they were met by officials from L'hasa, and all attempts to obtain permission to proceed southwards were fruitless. It was therefore resolved (in spite of great opposition) to take the route *viâ* Nak Chu to Sining. A deviation was made for the purpose of exploring the sources of the Mekong, and the most northern of the three commercial routes from L'hasa to Tatsien-lu was struck, the same that was followed for some distance by Miss Taylor. The lamas proving hostile, M. de Rhins repaired to Kierkudo (Kegudo of A— K—), the residence of a Chinese functionary, situated near the upper Yang-tse-kiang (the Tibetan name of which M. Grenard gives as Do-chu, not Di-chu). In the basin of the Dza-chu, or upper Mekong, the soil was generally red, the streams being enclosed in narrow gorges. The inhabitants are shepherds living in tents. All the Tibetans of these regions are said to be much more wild and violent than those further west. At Kierkudo the unfortunate affray took place which led to M. de Rhins' death. The cartridges having been all expended, and M. de Rhins fatally wounded, M. Grenard was left alone amidst the Tibetans, by whom he was seized and carried to the Yang-tse. He succeeded in crossing the river, and made his way to Sining, where he was kindly received by the Chinese authorities, and eventually all the papers of the expedition were recovered. Besides the route-surveys and astronomical and meteorological observations, extensive collections had been made, and over a thousand photographs taken.

New Summer Resort in Northern Persia.—A letter dated July 6 last, from "Killister, Rahmatabád"—a spot lying north of Manjil, on the well-known post-road connecting Resht with Tehran—gives an interesting account of a *yailák*, or summer resort, newly occupied by European residents in the Shah's dominions. Like the whole of Persia, the particular tract to which it belongs is stationary and without sign of progress; but the climate is described as delicious, and the native inhabitants, though poor, appear contented enough to illustrate the truism that happiness is independent of riches. In addition to the country brown bread (*nán-i-lavásht*), rolled out in sheets like a blacksmith's apron, these last can boast their little stock of curdled milk, nuts, and olives, the luxury of meat, however, being denied to the greater number for even one day in the week. Their lambs supply them with wool for winter clothing; they are much in the case of the man depicted by Pope—

> "Whose herds with milk, whose fields with bread,
> Whose flocks provide him with attire;
> Whose trees in summer yield him shade,
> In winter fire."

Idle and peaceful, they dwell in an atmosphere far superior to that of the plains, which, with their extensive rice-fields, are redolent of malaria. Said to be religious without fanaticism, they are little interfered with or molested by the outer world; and, being practically destitute of substance, they are spared the recurring exactions of governors and revenue collectors' agents, ever ready to squeeze a submissive population. Our correspondent, a physician of kindly heart and high professional repute in Persia, is himself engaged in ministering to the wants of many native patients gathered around him in these parts, and will doubtless acquire an exceptional celebrity in the locality which he describes, and in which his presence is turned to such good account. The *sanitarium* referred to is hardly to be considered a *terra incognita*; but the highlands amid which it is situated have constituted a theme of general rather than of minute exposition, especially for more recent geographers and travellers. If we go back beyond a hundred years, we shall find in M. Gmelin (to mention one name only) much that is instructive and interesting about the mountains of Gilan, whether it relates to products or people; and the subject is, at the present day, by no means exhausted.

Dr. Sven Hedin's Journey between the Yarkand and Khotan Rivers.—Through the kindness of General Venukoff, we have again been favoured with an extract from a letter of Dr. Sven Hedin, written to M. Petrovsky, the Russian consul at Kashgar, and dated "Buksem, Khotan-daria, May 22, 1895" (Buksam of the Society's map of Tibet). In crossing the desert between the Yarkand and Khotan rivers, which he was preparing to do at the date of his former letter (*ante*, p. 78), the traveller encountered great hardships from want of water, especially in the last part of the route, between the Mazar Tag and the Khotan river. The caravan was lost among the shifting sandhills, not a vestige of solid rock being seen. Four camels were lost, and many of the men were left *en route* unable to proceed, Dr. Hedin pushing on, and, after three terrible days, arriving on the fourth at the forests along the Khotan river. His companion, Kassim, was in an almost dying condition. Water was obtained by digging in the bed of the stream, and Dr. Hedin then made his way alone to Khotan, subsequently meeting his two companions and, fortunately, finding also the camel with his instruments. He afterwards started for Aksu, whence it was his intention to return to Kashgar.

Journey of Madame Massieu in Central Asia.—We also learn, through M. Venukoff, that this lady, who has lately been studying the ethnology of British India, plans to return to France through Central Asia, in order to become acquainted with the inhabitants of Turkistan. She proposes to travel either *viâ* Ladak, Karakoram, Kilian, and Kashgar, or *viâ* Gilgit, Hunza Aksu, Maral-bashi, and Kara-kul, according as permission is granted by the Indian government, proceeding finally by Osh, Samarkand, and Tiflis.

AFRICA.

The French Expedition in the Hinterland of Dahomey.—Details of the expedition under Commandant Decœur, to which reference was made in our last number, have been published in the *Bulletin* of the French African Association for July. From Carnotville, which served as the base for the replenishment of supplies, after a preliminary excursion in the district of the King of Gambari (capital Paraku), with whom a treaty was signed, a visit was made to Nikki, which was reached on November 25, 1894, Captain Lugard having been there early in the same month. Having been told that the English had concluded no treaty, Commandant Decœur is stated to have persuaded the king to accept the French Protectorate. From Maka, the point of departure of the caravan route to Gomba and the Niger, Lieut. Band was sent direct to Say, in order to anticipate the Germans, arriving there on February 1. Meanwhile the main expedition proceeded to Pama, the chief of which is stated to have owned allegiance to the King of Gurma. The advance party of the German expedition under Lieut. de Carnap had preceded it here, but, hastening to the capital of Gurma, the French commander reports that he concluded a treaty with the king, placing the whole country under French protection. He then joined Lieut. Band at Say, and apparently preceded the Germans on the way southwards to Gomba, exploring the country along the banks of the Niger. There seems, however, to be some confusion in the dates given, for both Lieut. Band and chief are stated to have arrived at Say on February 1.

Surveys in German Africa.—Astronomical observations, which, though not fulfilling all the requirements now being laid down for the mapping of Africa, are at any rate a contribution towards a better knowledge of the topography of that continent, continue to be made by the Germans in their various spheres of influence, and are published from time to time in the *Mitteilungen aus den Deutschen Schutzgebieten*. The second part of the volume for the present year contains the results of the observations made by Dr. Gruner (who has since become known for his successful explorations in the Niger basin) in 1894, those obtained in 1892 and 1893 having been already published in the last volume of that publication. According to Dr. Fritz Cohn, by whom the results have been calculated, the latitudes obtained attain a high degree of accuracy. That of the station of Misahöhe, derived from the mean of several observations, differing very slightly from each other, is given as 6° 56′ 91″ N. The longitude obtained for the same station by means of meridian distances, starting from Lome as a base, was 0° 41′ east of Greenwich, and a small number of longitudes of other places were obtained by the same method. The same part of the *Mitteilungen* contains latitudes observed by Dr. Stuhlmann in East Africa in 1894, principally on the coast between Dar-es-Salâm and Bagamoyo, as well as a large-scale map of German Kondeland, constructed by Dr. R. Kiepert, chiefly from the surveys of Captain H. Ramsay and the missionaries Neyer and Merensky. The important series of observations made by Captain Ramsay during the Nyasa expedition of 1893–94 were published in the *Mitteilungen* for last year (pp. 71, 78, 235), together with a large-scale map in four sheets constructed by Dr. Kiepert, while the same volume contains observations of positions on the route to the Victoria Nyanza *viâ* Tabora by Joseph Rindermann in 1892, and those made by Father Schynse west of that lake in 1891. Finally, a useful map of the coast region of the Cameroons, from the latest surveys, has been given in Part i. of the same publication for the present year.

The Sesse Islands, Victoria Nyanza.—Although so many travellers have passed near these islands in their voyages on the Victoria lake, they had never been examined minutely until 1893, when Father Brard was sent to inquire into the number and position of the Catholic inhabitants of the group. A short note based on a communication from him appears in the July number of *Petermann's Mitteilungen* accompanied by a map. Sesse proper, the principal island of the group, has a very irregular outline, being deeply indented by bays, which fact accounts for the uncertainty which long prevailed as to the number of units in the group. In spite of the havoc caused by the civil war, Sesse has still a population of 15,000 souls, ruled over by two chiefs. The inhabitants are hardy sailors. The island is divided into two parts by a depression only 3 to 6 feet above the level of the lake, across which canoes are dragged from one side to the other by the Basesse.

Dr. Stuhlmann's Collection in Ulunguru.—Dr. Stuhlmann, who, though primarily a zoologist, succeeded, during his expedition with Emin Pasha, in bringing together a valuable botanical collection, has lately sent another such collection, made during his journey to Ulunguru, September to December, 1894, to the Royal Botanic Museum in Berlin. He has, as far as possible, paid attention also to the conditions of the habitat and the characteristics of soil and mode of life of the various plants. It appears that Ulunguru resembles Usambara in the richness of the vegetation, and suitability for systematic cultivation (*Deutsches Kolonialblatt*, 1895, p. 296).

Captain Gillain on the Country between the Sankuru and the Lomami.—This officer, who was one of those attached to Baron Dhanis' expedition in 1892–94, has lately traversed the country lying between the upper courses of the Sankuru and Lomami, and supplies (*Mouvement Géographique*, 1895, No. 12) some account of the physical features of the region, which had in part been previously traversed by Delcommune and Bia. South of Lupungu's stronghold at Kabinda (visited by Dhanis and Hinde), near the sources of the Lurimbi, a mountain *massif* runs to the south-south-west, containing the sources of many streams flowing to the Sankuru, Lomami, and Lukassi. Further south, on the upper Luembe (tributary of the Sankuru), the rock everywhere crops out on the surface, forming vast agglomerations of blocks, resembling enormous monoliths. The river is much broken by rapids. The water-parting between the Luembe and Lomami is but slightly marked, and consists of a broad plateau. The Lomami flows in great part through a swampy plain, very difficult to cross, and Captain Gillain considers that most of the region between the Luembe valley and the Lomami has the same character. The water-parting between the Lomami and the Lualaba is formed by a line of gently rising wooded heights, a triangular plateau with isolated summits extending into the basin of the Lovoi. It is well wooded, especially towards the south, and is rich in caoutchouc.

The Congo Railway.—Recent despatches received in Brussels (*Mouvement Géographique*, 1895, No. 15) give a favourable account of the progress made on the Congo railway during the past year. Since the end of May last, the line has advanced beyond the hundredth kilometre, whereas on the 15th of the same month, in 1894, only the fifty-second kilometre had been reached. On June 17 the second section, as far as the station of Lufu (82·5 kilometres), was opened for traffic, and the monthly receipts have since risen from 11,000 to 39,000 francs, a sum which is likely soon to be exceeded, as the station of Lufu will not long remain the terminus of traffic. The health returns have been satisfactory during the past year.

Morocco or Marocco.—While the Arabic name Marraksh or Marrakesh (" the adorned "), applied to one of the capitals of the western kingdom of Barbary, was written by the Spaniards Maruecos, by the Italians Marocco, by the French Maroc, and by the Germans Marokko, the first vowel has in English been more frequently changed into *o*, no doubt owing to the slight distinction in the sound of the two letters when slurred over in the characteristic English fashion, and to the connection supposed to exist between the name of the country and the "Moors." Count Gleichen writes to us urging that an effort should be made for the adoption of the more correct spelling "Marocco," which has already been used to some extent in English publications. Indeed, this form is found in the sixteenth century, in 'Hakluyt's Voyages;' but during the next two centuries the other form seems to have come into fashion, being found in Addison's 'West Barbary' (1671), in Simon Ockley's 'Account of South-West Barbary' (1713), in the 'Geographical Dictionary' published by J. Coote (2 vols. folio) in 1759–60, and in other works. During the present century both forms have been largely used. Richardson (' Travels,' etc., 1860) still writes Morocco, though he gives the Arabic form as Maraksh (not Moraksh, as is stated in Egli's 'Nomina Geographica'). The more correct spelling is used by Hooker and Ball, by Lieut.-Colonel Trotter, and also in Stanford's 'Compendium,' and other recent works, though the form Morocco still holds its own in popular usage. It certainly seems desirable that Count Gleichen's suggestion should be adopted.

M. Gautier's Explorations in Madagascar.—In the fourth volume of the *Journal* (p. 565) we gave some account of M. Gautier's explorations in the west of Madagascar down to the beginning of 1894. That traveller has since returned to France, and has given before the Paris Geographical Society (*Comptes Rendus*, 1895, pp. 106 *et seq.*) a general account of his explorations during the past three years, including his journeys in the extreme south-west of the island in the latter part of 1894. The tribes in this region (five in number) are quite independent of the Hovas, and are equally important with the Sakalavas, though much less known. The Baras are mountaineers, and do not reach the coast at any point. Small Hova traders bring them the goods of which they have need, and the Hova influence is thus gradually extending among them. They are great brigands. The Antanosy, among whom Fort Dauphin was founded in the seventeenth century, are the most intelligent, and the Antandroy and Mahafaly the most exclusive in Madagascar. The greater part of the territory of the Antandroy is occupied by an enormous basaltic system, formed by a vast horseshoe basin with a basaltic table-land in the centre. The vegetation is very scanty owing to the dry southerly winds, and has quite a special character. M. Gautier has also contributed a paper on the physical geography of the west of Madagascar to the *Annales de Géographie* (1895, No. 4), accompanied by a valuable hypsometrical map of the island, in which the points of orography brought to light by his explorations are shown.

A New Coffee-Parasite in East Africa.—Since the year 1893 a new coffee-parasite has appeared in German East Africa, having been first observed in the small plantation of the Mission Station at Morogoro. Dr. O. Warburg gives a short account of its life-history and of the measures to be adopted for its destruction in the *Mitteilungen a. d. Deutschen Schutzgebieten* (1895, p. 130), with a plate showing its various stages. To which class of beetles it belongs is still uncertain, but it has been ascribed to the genus *Herpetophygas*, of which the only species hitherto known is found in Kaffraria. It must therefore be indigenous to tropical Africa, and to it must probably be attributed the damage done to coffee plantations in various other parts of the continent. The length of the full-grown beetle is one inch. The larva bores longitudinal passages in the young thin branches, with occasional openings to the surface, but in the lower parts of the shrub it attacks chiefly the cambium layer, and in this way soon causes the destruction of the plant. Dr. Warburg considers that with suitable precautions the destruction of this pest in the plantations should not be difficult, and especially recommends the destruction of the young larvæ in the borings by means of petroleum or sulphide of carbon, the openings to the air, which occur in regular rows, offering special facilities for the application of these liquids by means of an oil-can with fine tube. As also the ant known as *Odontomachus hæmatodes* has been found on the attacked shrubs, it is possible that it may prey upon the larvæ, and so become a valuable ally in the work of extermination. In newly cleared portions of forest it is important to remove any decaying wood, etc., which might harbour the parasite. In connection with this subject, it may be noticed that a most favourable report has been given as to the results of the introduction of West Indian coffee into the Cameroons, the produce resembling the true Mocha sort, and possessing a full and excellent flavour (*Deutsches Kolonialblatt*, 1895, p. 354).

Sijilmásiyah.—In Major Raverty's letter on "Sijilmásiyah and Tafilet," in the August number of the *Journal*, the printer has reversed the two last Arabic words, which were correct in the proof. That on,p. 189 should be فاس, and that on p. 190 عامرة.

AMERICA.

The Sources of the Mississippi.—When the boundaries between the newly recognized United States and the remaining British territory in North America were first arranged, a part of the frontier was formed by a line drawn from the north-western point of the Lake of the Woods, "on a due west course to the river Mississippi." The Mitchell map (1755), which was consulted by the plenipotentiaries in drawing up the treaty, showed the Lake of the Woods as the upper St. Lawrence, and noted that the head of the Mississippi was probably about the fiftieth degree of latitude and the western bounds of the map. At that time no white man was known to have visited the source of the Mississippi, the region attracting neither trader nor missionary. Even the red men did not know the district well, as it was in that intermediate region between tribal lands known as "the road of war." In 1804 William Morrison was stationed at a trading outpost, and visited a lake called Omoskos Sogiagon by the Ojibways, which thereafter became known by the English equivalent Lake Elk. The name may be derived from the shape of the lake, a head with two horns, or from the elk remains found there. In old French maps the name Lac la Biche occurs, but there is no record of how the information about it was obtained by them. The first accurate information we have is from H. R. Schoolcraft, a geologist and mineralogist, who had accompanied General Cass on an unsuccessful attempt to reach the source of the Mississippi in 1820, but had indicated a Lake Labeish on the map he published. He was commissioned to return to the region, and in 1832, accompanied by Lieut. Allen and two others, he was guided up the Mississippi by an Ojibway named Ozawindib, to the Elk lake, where he remained a day, hoisted the stars and stripes, and named the lake Itasca (*Veritas Caput*, with the first and last syllables removed), the true head of the great river. Jean Nicollet was the next to survey the lake, and he saw in a stream, flowing into its western branch, which he traced through the lakes, the "Infant Mississippi." Somewhat to the east of this he showed a deep bay of the lake which in later times seems to have been cut off from the main lake, owing to the fall of the water-level. Julius Chambers saw this lake in 1872, after dragging his canoe along a shallow creek for a third of a mile, and considered it the source of the river. To this small lake the old name of Elk lake was given by the State Survey of 1875, since the larger body of water, since Schoolcraft's day, had been known as Lake Itasca. At least other three Europeans visited this lake before W. Glazier did so in 1881, named it Lake Glazier, asserted it formed the headwaters of the Mississippi, and claimed to be their discoverer. He sent a letter and a map to the Royal Geographical Society, announcing his "discoveries," which were published in January, 1885, but the validity of the "discoveries" was questioned in later numbers of the *Proceedings*. Mr. Glazier wrote a book, 'Down the Great River,' which was severely criticized. The amount of controversy raised by Mr. Glazier's book led the Historical Society, and ultimately the State of Minnesota, to institute a special survey under the direction of the Honourable J. V. Brower, who was also appointed Commissioner of the 35 square miles round the sources of the Mississippi, which the State legislature set aside as a "permanent park reservation." This Mr. Brower has done,* and has shown that Nicollet's "Infant

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* 'The Mississippi River and its Source: a Narrative and Critical History of the River and its Headwaters, accompanied by the Results of Detailed Hydrographic and Topographic Surveys.' By Hon. J. V. Brower, Commissioner of the Itasca State Park, Minneapolis, Minn. Harrison & Smith, 1893.

Mississippi is truly so called, while there exists a secondary supply of water flowing into the other branch of Lake Itasca. As to Elk lake when the waters of Lake Itasca were very high in 1890, it was really lower than the larger sheet of water, although usually Elk lake is about a foot above it, and its waters flow into it by a shallow creek. On tracing the Infant Mississippi, two lakelets were found, but the waters of the last were supplied from plentiful springs, which rise just below the end of a third lakelet Nicollet's upper lake), which in turn receives water that has come through other and higher lakelets. Beyond these again, and higher up, Mr. Brower discovered other lakelets, without surface outlets; but, as the water is constantly bubbling up at the foot of the slight hills, formed of old moraines, they are the ultimate reservoirs collecting the waters which flow continuously from the Mississippi springs to the Gulf of Mexico. The length from the mouth of the river to the furthest of the lakes, which lies 1558 feet above the sea-level, is 2555¼ miles; to the Mississippi springs (1535 feet), 2547 miles; and to Lake Itasca, 2546½ miles, which place is 1457 feet above the level of the sea. The average fall of the river is thus about 7¼ inches per mile.

German and Italian Colonies in the South of Brazil.—A Foreign Office report by Mr. Walter R. Hearn, lately published (Miscellaneous Series, No. 367), contains the account of a visit made by him to the German and Italian colonies in the valley of the river Cahy, in the state of Rio Grande do Sul, during the autumn of last year. The particulars given as to the progress, present condition, and prospects of the colonies of the two nations are valuable, in view of the small amount of information available respecting them. Starting from Porto Alegre, the river Cahy was ascended by paddle-steamer as far as São Sebastião, the principal centre of the German colonies in that direction, and the limit of navigation by the barges or paddle-wheel steamers in which the colonial produce is brought down. Beyond this point, a road made by Government about seventeen years ago leads to Caxias, the centre of the Italian colonies (55 miles further); but, being merely a broad cleared track, it becomes almost impassable in rainy weather. It passes through well-cultivated fields alternating with patches of forest, and in spite of its bad condition, a very extensive traffic, both by waggons and mules, passes along it. Among the productions of the country are mentioned silkworms, beeswax, wine, and oranges, from which last a very pure, mild spirit is distilled. As the road ascends to the hill country, valuable forests of pine (*Araucaria braziliana*—Lamb) are reached. The town of Caxias is 2600 feet above sea-level, and has better houses and streets than any of the German towns. Although nearly all the Italian colonists were derived from the very poorest class, and wholly devoid of capital, they have shown much energy. Flour-mills and saw-mills have been constructed, and the land is well ploughed and planted, though here, as in the older German colonies, greater agricultural knowledge and improved appliances are much needed, as well as the opening up of means of communication with the markets. The Germans, though less energetic, are said to be more plodding than the Italians, and more inclined to settle down as permanent citizens. The great desideratum is a railway to Caxias, which might consist of a continuation of the existing branch line to New Hamburg, and as the history of the latter, which is itself fed solely by the colonies, is one of uninterrupted progress, there can be no doubt as to the success of such an extension.

POLAR REGIONS.

Mr. H. J. Pearson's Expedition to Novaya Zemlya.—This expedition, which left England in the end of May, with the intention of visiting Novaya Zemlya, returned to England on August 12. The members of the party were

Mr. H. J. Pearson, Mr. C. E. Pearson, the Rev. H. H. Slater, and Colonel Feilden. Leaving Vardö in the steam-yacht *Saxon* on June 14, a course was laid for Nameless Bay, in the north-west of Novaya Zemlya (proper). The ice conditions in Barents Sea were found to be extremely unfavourable. Impenetrable pack was met about 80 miles from the west coast of Novaya Zemlya, trending towards the north-west, and several days were spent in cruising along the edge of this heavy ice to the south-east. Every likely bight in the pack was entered, and in some cases these indentations were followed for 20 to 30 miles, but invariably heavy polar ice barred the way, and the yacht had to return to open water. Coal running short, the vessel bore up for Vardö to refill. The members of the expedition were landed on the Murman coast of Russian Lapland, near Svatoi Nos, where they went into camp. A week was spent there profitably, in ornithological, botanical, and geological investigations. On the return of the yacht from Vardö, a second attempt was made to reach Novaya Zemlya. The pack was again met with in about the same meridian as before, but a fortunate lead showing, the vessel ran some 40 miles through the pack, and found a large space of open water about the centre of Goose Land. Unfortunately, a dense impenetrable pack of 8 to 10 miles in width was jammed against the shore, and connecting with the main pack off North and South Goose Capes; in fact, the vessel lay in a large water-hole. An attempt was made to press the yacht towards North Goose Cape, in the hope of open water being found in the direction of Möller Bay, which resulted in the little vessel being nearly beset in the pack, but eventually the large pool of open water off Goose Land was regained. The wind now shifted to the south-east, and the lead by which the yacht had entered closed entirely. The pack came up from the direction of Meodusharsky Island, and hour by hour the water-pool contracted. Again coal had begun to run short, when fortunately a good lead opened to the south-west; a run was made for it, and, after passing through 40 miles of dense pack on either side, open water was reached, the yacht running down to the island of Kolguev with the ice in sight all the way on her port side. A landing was effected on Kolguev on July 5, and the members of the expedition went into camp near the mouth of the Kriva river, on the south-west side of Kolguev. The *Saxon* returned from Vardö and took the party off on July 16. Good results were obtained on Kolguev in various branches of natural history, and a series of interesting photographs were taken. During the stay of the party on Kolguev the weather was very bad, the temperature seldom rising above 35° Fahr., with fogs, and bitter cold winds from north and north-west; part of the time the pack came down and girdled the west side of the island. Kolguev was left on July 16, and a third attempt was made to reach Novaya Zemlya. A marvellous change had occurred in the conditions of the ice. The impenetrable pack which a fortnight previously stretched from Kolguev to Novaya Zemlya had altogether disappeared, and the *Saxon* reached Kostin Shar on the evening of July 17, without encountering a piece of ice worth mentioning. Stoppages of some days were made at several anchorages in Kostin Shar, notably in Nechwatowa Bay, the final anchorage being at the head of Belucha Bay, near South Goose Cape. The Samoyede settlement in that locality was visited. A considerable river not marked in the charts, which enters the north-east of Belucha Bay, was explored. The *Saxon* returned to Vardö on July 30, after an interesting and adventurous voyage.

Captain Wiggins's Expedition to the Yenisei River.—Captain Wiggins started from the Tyne for Golchika, at the mouth of the Yenisei, on August 12. His vessels are the *Lorna Doone* and the *Burnoul*, and they are taking out a miscellaneous cargo, which is to be exchanged at Golchika for some hundreds of tons of graphite. The expedition, as we understand, is mainly at the cost of Mr.

Leybourne Popham, whose vessel, the *Stjernen*, was lost through fog and untoward currents at the mouth of the Yugor Shar last year. This, however, was a mishap that could in no way be attributed to ice; so it is very satisfactory to see that it has not deterred Mr. Popham from coming forward again as a supporter of the Kara Sea route to Siberia. It is curious to read of bicycles and quantities of barrels of salted herrings as forming part of the cargo of "notions" destined for the hyperborean dwellers of the Yenisei valley.

OBITUARY.

Sir Thomas Wade, K.C.B., G.C.M.G.

SIR THOMAS FRANCIS WADE, whose death at Cambridge, at the age of seventy-seven years, has been announced, had been a Fellow of the Society since 1863, and had served on the Council between 1885 and 1888. Although not primarily a geographer, he took a warm interest in the proceedings of the Society, and often took part in the discussions on papers relating to China and neighbouring countries. It is in connection with our diplomatic relations with the Chinese Empire, and as a student of Chinese literature, that his name is best known, and during the long period of his service in the East there were few important negotiations in which he did not in some way or another take part. Elder son of Sir Thomas Wade, C.B., he was born in 1818, and, after receiving his education at Harrow, entered the army as ensign in the 81st Foot, subsequently serving in the 42nd Highlanders and (as lieutenant) in the 98th Foot, his first service in China taking place in 1842. He became interpreter to the garrison at Hong Kong (1843), assistant Chinese secretary (1847), and, after having been transferred to Shanghai as vice-consul in 1852, returned as Chinese secretary in 1855, and was soon after sent by Sir J. Bowring on a special mission to Cochin China. His acquaintance with the Chinese language and people led to his employment under Lord Elgin during his mission to China, and in 1861 he was made a C.B. in recognition of his services. He was made Chinese secretary and translator to the British Legation in 1863, and after twice acting as Chargé d'Affaires in Peking, became in 1871 envoy extraordinary and minister plenipotentiary, and chief superintendent of British trade in China. While holding this important post, he did valuable service by his negotiations in the interests of British trade in China. He also benefited geographical science by the warm interest which he took in the mission of Mr. Margary and the journey of Captain Gill, and after the murder of the former his untiring zeal led to the conclusion of the celebrated Chi-fu convention. He retired on a pension in 1883. Sir Thomas Wade was essentially a man of study, and in this respect a contrast has been drawn between him and Sir Harry Parkes, who took an equally important part in Chinese politics, the latter being described as more a man of action. Sir Thomas Wade published in 1867 the 'Tzŭ-Erh Chi' (Progressive course), treating of the Chinese language both colloquial and written. He formed a most valuable collection of Chinese works, which he presented in 1887 to the library of the Cambridge University, in which he was appointed first professor of Chinese in 1888. He used to urge on geographers the importance of a study of Chinese works in the interests of their science, holding that as much could be done in this way to throw light on the topography of remote parts of the empire as by renewed explorations. He was made K.C.B. in 1875, and G.C.M.G. in 1889. He married, in 1868, Amelia, daughter of Sir John Herschel.

Joseph Thomson.

By E. G. Ravenstein.

On August 2 there died, at the residence of his friend Mr. S. W. Silver, and after a long and painful illness, Joseph Thomson, whose name will for ever rank foremost among those who, in the second half of the nineteenth century, have revealed to us the geographical secrets of Central Africa, and paved the way for its ultimate civilization. Joseph Thomson was born on February 14, 1858, at Penpont, a small village near Thornhill, in Dumfriesshire, the youngest of the five sons of Mr. William Thomson, who survives him. Early in life the late Dr. Grierson instilled him with a love of natural science, and subsequently he profited much from Sir Archibald Geikie's lectures on geology, which he attended.

JOSEPH THOMSON.

In 1878 the Royal Geographical Society organized an expedition for the exploration of the Central African lakes. Mr. Keith Johnston, a geographer of distinction, was appointed its leader, and Mr. Thomson, who describes himself at that time as an "unskilful youth," was selected to accompany him as geologist. The expedition left Zanzibar in January, 1879. On June 28, its leader succumbed to dysentery at Behobeho. Thomson proved equal to the trying position in which he was placed, and at once resolved to carry out the objects for which the expedition had been fitted out. This bold resolve—bold in a youth of twenty-one—was crowned with complete success. Thomson was the first to reach the Nyasa from the north; he crossed the plateau separating that lake from Tanganyika, followed the western shore of the latter to its outlet the Lukuga, examined that river for a distance of 60 miles, and ultimately found himself within a short distance of the upper Congo, or Lualaba, when his progress was stopped by a chief of Urua, and he was reluctantly compelled to retrace his steps. On his return journey to the coast Thomson visited Lake Rukwa, or Leopold. In June, 1880, he was back at Zanzibar. This expedition not only yielded valuable topographical details, but also the first precise notions of the geological structure of Eastern Africa.*

Almost immediately after his return, Thomson started on a second expedition. Coal had been reported to exist on the Lujenda, the southern source-river of the Rovuma. The Sultan of Zanzibar was anxious for fuller information, and entrusted the rising young explorer with the task of ascertaining the facts. Thomson started from Mikindani in July 13, 1881, and spent three months on this expedition. The "coal," unfortunately, turned out to be merely bituminous shale, and Thomson lost the favour of his employer.†

Scarcely had he returned to his native land, when he was offered the leadership of an expedition which the Royal Geographical Society intended to despatch into the country of the Masai. At that time only a few Europeans had come into contact with this fierce pastoral tribe, the interior of whose country was still absolutely untrodden except by Swahili caravans starting from Pangani or Mombasa. Dr. G. A. Fischer anticipated some of Thomson's discoveries. Having left Pangani in December, 1882, he succeeded in reaching Lake Naiwasha, where his further progress was stopped by the hostility of the natives. This happened in June. Thomson started from Rabai, near Mombasa, on March 15, 1883. After a rush up Kilimanjaro, which he climbed to a height of 9000 feet, he attempted to pass to the west of that mountain. But Dr. Fischer had been fighting there, and Thomson, who was anxious on all occasions to avoid hostilities with the natives, turned back. Having replenished his supplies, he left Rabai for the second time on July 17. He now passed to the east of Kilimanjaro; reached Naiwasha on September 29; crossed the Laikipia plateau to within a short distance of Mount Kenya; explored Lake Baringo, which turned out to be a comparatively small sheet of water; and ultimately, on November 12, stood at the north-eastern extremity of the Victoria Nyanza, in Kavirondo. On his return to the coast, he visited the cave-dwellers on Mount Elgon. On May 27, 1884, he was back at Rabai. ‡

The results of this expedition were of the first importance, and the thoroughness of his work as a geological pioneer has been ungrudgingly recognized by his successors. The Royal Geographical Society, fully conscious of the excellent services rendered by him, awarded him their Founder's medal (*Proc. R.G.S.*, 1885, p. 474).

In 1885 Thomson was despatched to Sokoto on a diplomatic mission, which he accomplished to the full satisfaction of his employers, the predecessors of the Royal Niger Company. The treaties negotiated by him with the Sultan of Sokoto and other chiefs in the Central Sudan, have enabled England to claim extensive regions in the Niger-Benue basin as lying within the British "sphere." §

In 1885 Thomson, accompanied by Lieut. Harold Crichton-Browne, paid a short visit to Morocco. He twice crossed the Atlas, and although he failed in his attempts to penetrate into Wadi Draa and Sus, he considerably enlarged our knowledge of the region explored by him.[*]

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* See 'To the Central African Lakes and Back,' 2 vols. (London: Sampson Low, 1881); and *Proceedings R.G.S.*, 1880, pp. 721–742.

† "Notes on the Basin of the River Rovuma," in *Proceedings R.G.S.*, 1882, pp. 65–79.

‡ 'Through Masai-Land' (London: Sampson Low, 1885); *Proceedings R.G.S.*, 1884, pp. 690-712.

§ See a paper read before the British Association, *Proceedings R.G.S.*, 1886, p. 735.

About this time Thomson was offered a lucrative appointment at home. His mind, however, was still fixed upon Africa, and having published a brightly written 'Life of Mungo Park' (Philip and Son, 1890), he gladly embraced an opportunity for exploring the northern portion of British Central Africa which was afforded him by Mr. Rhodes. He travelled up the Zambezi and Shire to Nyasa, and on August 23, 1890, accompanied by Mr. T. A. Grant, a son of the late Colonel Grant, he left Kotakota on the western shore of that lake, and traversed the country as far as Lake Bangweolo. On January 4, 1891, he was once more at Kotakota.[†] He returned, however, broken in health. A prolonged treatment in Edinburgh and London proving of no avail, he went out once more to South Africa, in search of health, staying for some time at Kimberley, the honoured guest of Mr. Rhodes. He unfortunately returned home before the beneficial effects of the climate had had a chance of ameliorating his condition; an attack of influenza supervened, and he died at the early age of thirty-seven.

Thomson was of a lovable nature. Cheerful, modest, unselfish, and forbearing, he made numerous friends. As an explorer he possessed remarkable qualifications. At a glance he was able to grasp and map the features of the countries he traversed. He never lost sight of the object he had in view, but although by no means deficient in personal bravery, he sought to overcome resistance rather by an exercise of patience than by violence. He was one of the few among our great African explorers who could boast that he never shed a drop of native blood, not even in self-defence.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. R. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revué, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Ægean Sea. *Globus* 67 (1895): 309–314. **Schott.**

Das Ägäische Meer. Ein Beitrag zur Hydrographie desselben von Dr. Gerhard Schott. Hamburg. *With Maps.*

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[*] 'Travels in the Atlas and Southern Morocco' (London: Philip and Son, 1889); and *Proceedings R.G.S.*, 1889, p. 1.

[†] "To Lake Bangweolo and the Unexplored Region of British Central Africa," in the *Geographical Journal*, i., 1893, pp. 97–121.

Austrian Alps. *M.G. Ges. Wien* 38 (1895): 207-226. **Schönberger.**
Orometrisches aus den Niederen Tauern. Von Franz Schönberger, Professor in Brünn. *With Diagram.*

Balkan Peninsula—Montenegro and Albania. *Alpine J.* 17 (1895): 405-419. **Cozens-Hardy.**
The Mountains of Montenegro and Albania. By W. H. Cozens-Hardy. *With Map.*

Danube. **Fugger and Kastner.**
Donau-Studien. Nach dem Plane und den Instructionen von Dr. Jos. Ritter v. Lorenz-Liburnau. Dritte Abhandlung. Die Geschiebe des Donaugebietes. I Die Geschiebe der Salzach von Prof. Eberhard Fugger und Prof. Karl Kastner in Salzburg. Beilage zu Band XXXVIII. (1895) der 'Mittheilungen.' Wien, 1895. Size 9½ × 6½, pp. 148. [Bound up with 'Mittheilungen' 38 (1895). No. 2.]

England, Climate of South Coast. **Black.**
Meteorology, Seaside, English Channel—Winter. By W. G. Black. *With Four Plates.* Reprinted from the *Transactions* of the Royal Scottish Society of Arts. [Read before the Society, February 13, 1893.] Size 9 × 6, pp. [12.]

European Glacial Deposits. *J. Geology* 3 (1895): 241-269. **Geikie.**
The Classification of European Glacial Deposits. By James Geikie.

France—Gold-deposits. *B.S. Languedoc. G.* 17 (1894): 285-326. **Viala.**
Les Gisements d'or en France considérés dans leurs rapports d'origine et de richesse avec les autres gisements aurifères. Par L.-Fernand Viala.

France—Herault. *B.S. Languedoc. G.* 17 (1894): 350-386, 472-509. **Laponge.**
Matériaux pour la Géographie anthropologique du département de l'Hérault. Par M. G. De Laponge.

France—Northern Coal Basin. *B. Union G. Nord France* 15 (1894): 216-240. **Gilles.**
Le bassin houiller du Nord et du Pas-de-Calais. Par M. Gilles.

France—Vosges Lakes. *B.S.G. Paris* (7) 15 (1894): 557-604. **Thoulet.**
Contribution à l'étude des lacs des Vosges. Par M. J. Thoulet. *With Illustrations.*

Germany—Bavaria. **Fels.**
Bruckmann's Illustrated Guides. The Highlands of Bavaria, with Salzburg and the Adjacent Parts of the Tyrol. By Dr. Gsell Fels. Translated by J. Albert Swallow. With Views, a Map of the Environs, a Plan of the City, and a large Tourist's Map. Munich: A. Bruckmann, 1895. Size 6½ × 4½, pp. xii., xvi., and 238. *Price* 2.50 *marks. Presented by Messrs. Asher & Co.*

Germany—Bavaria—Munich. **Fels.**
Bruckmann's Illustrated Guides. Munich. By Dr. Gsell Fels. With Views, a Map of the Environs, and a Plan of the City. Munich: A. Bruckmann, 1895. Size 6½ × 4½, pp. xvi. and 64. *Price* 1 *mark. Presented by Messrs. Asher & Co.*

A clearly written guide of convenient size, with serviceable maps.

Germany—Kiel Canal. **Beseke.**
Der Nord-Ostsee-Kanal. Seine Entstehungsgeschichte, sein Bau und seine Bedeutung in wirthschaftlicher und militärischer Hinsicht. Von C. Beseke. Kiel & Leipzig: Lipsius & Tischer, 1893. Size 9½ × 6½, pp. viii. and 148. *Maps and Plans.*

This work discusses the military and commercial conditions of the new canal, and, amongst others, contains a remarkable map of the shipwrecks which have taken place round the coast of Jutland.

Germany—Kiel Canal. ———
'Nord-Ostsee-Kanal-Nummer' 'Illustrirte Zeitung.' Leipzig and Berlin, 15 June, 1895. Size 16½ × 11½, pp. [19]. *Maps and Illustrations (including Panorama).*

Special number of the *Illustrirte Zeitung*, with illustrations of the Kiel Canal.

Germany—Kiel Canal. *J.R. United Service I.* **39** (1895): 623–633. ———
North Sea and Baltic Canal. *With Map, Plans, etc.*

A short account, with plans and sections.

Germany—Poland. **Auerbach.**
Un problème de Colonisation Intérieure, La Germanisation de la Pologne Prussienne. Par Bertrand Auerbach. Annales de l'École Libre des Sci. Politiques. X. Année, No. 2, 15 Mars, 1895. Extrait. Paris: F. Alcan, 1895. Size 10 × 6½, pp. [16]. *Presented by the Author.*

Greece. *Z. Ges. Erdk. Berlin* **30** (1895): 135–226. **Philippson.**
Reisen und Forschungen in Nord-Griechenland. Von Dr. Alfred Philippson. I. Teil. *With Maps and Profiles.*

Germany—Longitudes. ———
Veröffentlichung des Königl. Preussischen Geodätischen Institutes. Astronomisch-Geodätische Arbeiten. I. Ordnung. Telegraphische Längenbestimmungen in den Jahren 1890, 1891, und 1893. Berlin: P. Stankiewicz, 1895. Size 12 × 9, pp. vi. and 242.

The telegraphic longitude determinations treated of in this volume are Springberg-Schönsee, Berlin-Springberg, Berlin-Potsdam, and Ubasberg-Göttingen; Ubasberg-Bonn; Bonn-Göttingen.

Italy—San Marino. *B.S.R. Belge G.* **19** (1895): 135–160. **Hauttecœur.**
La république de San Marino. Par H. Hauttecœur.

Italy—Venice. **Primo.**
Lanzoni Primo. Il Porto di Venezia. Venezia: Carlo Ferrari, 1895. Size 12 × 9, pp. 50. *Plans.*

A description, with somewhat roughly sketched maps, of the Venice of to-day; to be followed by an account of the historical changes in the port of Venice.

Mediterranean Tour. ———
A Cruise to Morocco, Balearic Isles, South of France, Italy, Sicily, Syria, Palestine, Egypt, Algeria, etc., by the Orient Company's s.s. *Garonne*, February 20, 1895. Size 10 × 7½, pp. 38. *Map and Illustrations.*

Rhine. *Tijds. Ned. Aard. Genoots. Amsterdam* (2) **12** (1895): 169–182. **Beekman.**
De Rijn van onzen tijd als groote handelsweg. Voordracht gehouden in de Vijf en zeventigste Algemeene Vergadering van het Koninklijk Nederlandsch Aardrijkskundig Genootschap. Door A. A. Beekman.

On the Rhine as a great trade-channel.

Russia. **Voeikoff.**
Meteorologicheskiya Selkokhozyaistvennuiya Nablyudeniya v Rossii v 1892 i 1893 gg. A. I. Voeikoff. [Meteorologico-Agricultural observations in Russia in 1892 and 1893.]—Zapiski Imp. Russ. Geogr. Soc. Gen. Geography, xxix., No. 3. St. Petersburg, 1895. Size 10 × 7, pp. 130. *Presented by the Imperial Russian Geographical Society.*

Russia—Swanetia. *Scottish G. Mag.* **11** (1895): 273–299. **Dingelstedt.**
The Caucasian Highlands: a Physical, Biological, and Ethnographical Sketch of Svanetia. By Victor Dingelstedt.

Russia—Sand-storms. *Rev. Scientifique* (4) **3** (1895): 571–573. ———
Les ouragans de poussière dans la Russié méridionale.

Russia—Tundras. **Jackson.**
The Great Frozen Land (Bolshaia zemelskija Tundra). Narrative of a Winter Journey across the Tundras and a sojourn among the Samoyads. By Frederick George Jackson. Edited from his journals by Arthur Montefiore. London: Macmillan and Co., 1895. Size 9½ × 6½, pp. xviii. and 298. *Map and Illustrations. Price* 15*s*. *Presented by the Publishers.*

An admirably written record of Mr. Jackson's journey in the Tundras, with a series of appendices, including a description of the outfit of the *Windward*.

Scotland. **Jusserand.**
A Journey to Scotland in 1435. By J. J. Jusserand. From the *Nineteenth Century*, June, 1895. Size 10 × 6½, pp. [17].

Scotland—Railway Guide. **Melven.**
Official Guide. North British Railway. West Highland Railway.

Guide to Scotland. By William Melven. Maps by Bartholomew, and Forty-seven Views from Photographs. Edinburgh: T. C. and E. C. Jack, 1895. Size 7¼ × 4¾, pp. 200.

Switzerland. **Baedeker.**

Switzerland and the adjacent portions of Italy, Savoy, and Tyrol. Handbook for Travellers. By Karl Baedeker. Sixteenth Edition. With 47 Maps, 12 Plans, and 12 Panoramas. Leipsic: Karl Baedeker, 1895. Size 6½ × 4½, pp. xxx. and 500. *Price 8 marks. Presented by the Editor.*

Switzerland. ———

Schweizerisches Ortschaftenverzeichnis. Dictionnaire des Localités de la Suisse. Herausgegeben vom eidg. statistischen Bureau. Publié par le bureau fédéral de statistique. Bern: Orell Füssli, 1895. Size 10 × 6¾, pp. 222.

A concise gazetteer of the Swiss communes.

ASIA.

Afghanistan. **McFall.**

With the Zhob Field Force, 1890. By Captain Crawford McFall. London: W. Heinemann, 1895. Size 9½ × 6¼, pp. 232. *Illustrations. Price* 18s.

An interesting account of the expedition to the Zhob valley in 1890–91, with a number of spirited sketches by the author.

Arabia—Mecca. *B.S. normande G.* 17 (1895): 1–9. **Courtellemont.**

Voyage à la Mecque. Par M. Gervais Courtellemont.

The author states that he visited Mecca in order to complete a series of photographic views of Mussulman countries, and he illustrated his lecture with a series of lantern slides of Mecca.

Arabian Sea—Laccadive Islands. **Oldham.**

J. Asiatic S. Bengal 64 (Pt. II.) (1895): 1–14.

Natural History Notes from H.M. Indian Marine Survey Steamer *Investigator*, Commander C. F. Oldham, R.N., commanding. Series II., No. 18. I. The Topography of the Arabian Sea in the Neighbourhood of the Laccadives. II. The Physical Features of some of the Laccadive Islands, with Suggestions as to their Mode of Formation. By Commander C. F. Oldham. *With Plates.*

Asia Minor—Kizil Irmak River. **Flottwell.**

Aus dem Stromgebiet des Qyzyl-Yrmaq (Halys). Von V. Flottwell. [Dr. A. Petermanns Mitteilungen, Ergänzungsheft, Nr. 114.] Gotha: Justus Perthes, 1895. Size 11 × 8, pp. 56. *Map and Plans.*

This important memoir will be referred to in the Monthly Record.

Asia Minor—Phrygia. **Ramsay.**

The Cities and Bishoprics of Phrygia; being an Essay of the Local History of Phrygia from the Earliest times to the Turkish Conquest. By W. M. Ramsay, D.C.L., etc. Vol. I. The Lycos Valley and South-Western Phrygia. Oxford: the Clarendon Press, 1895. Size 10 × 7, pp. xxii. and 352. *Map and Plan. Price* 18s. *Presented by the Clarendon Press.*

A massive contribution to historical geography which will be specially reviewed.

China. **Werner.**

The China Problem and its Solution. By E. T. C. Werner. From the *Fortnightly Review*, April, 1895. Size 10 × 6½, pp. [13].

China. **Schlegel.**

Problèmes Géographiques. Les peuples étrangers chez les historiens Chinois. XIX. Lieou-Kieou-kouo. Le Pays de Lieou-kieou. Par Gustave Schlegel. "Extrait du T'oung-pao," vol. vi. No. 2. Leide: E. J. Brill, 1895. Size 10 × 7, pp. 52.

Ditto. XX. Niu-jin-kouo. Le Pays des Femmes (méridional). Par Gustave Schlegel. "Extrait du T'oung-pao," vol. vi. No. 3. Leide: E. J. Brill, 1895. Size 10 × 7, pp. 12.

China—Manchuria. *Scottish G. Mag.* 11 (1895): 217–231. **Ross.**

Manchuria. By the Rev. John Ross, D.D. *With Map.*

China—Mongolia. *M.G. Ges. Wien* 38 (1895): 85–118. **Leder.**
Eine Sommerreise in der nördlichen Mongolei im Jahre 1892. Von Hans Leder. II. Vom Orchon an den Tuin-gol.

China and Japan. *G.Z.* 1 (1895): 19–39. **Richthofen.**
Der Friede von Schimonoseki in seinen geographischen Beziehungen. Von F. von Richthofen.

India—Chitral. **Griffin.**
Chitral and Frontier Policy. By Sir Lepel Griffin. From the *Nineteenth Century*, June, 1895. Size 10 × 6½, pp. [10].

India—Railways. *J.S. Arts* 43 (1895): 569–587. **Parry.**
The coming Railways of India and their prospects. By J. W. Parry.

Japan—Bronze Casting. **Gowland.**
The Art of Casting Bronze in Japan. By W. Gowland. A Paper read before the Applied Art Section of the Society of Arts, April 23, 1895. Reprinted from the *Journal of the Society of Arts*, May 3, 1895. London: printed by W. Trounce, 1895. Size 11 × 7½, pp. 38. *Illustrations. Presented by the Author.*

Korea. *B. American G.S.* 27 (1895): 1–20. **Griffis.**
Korea and the Koreans: in the mirror of their language and history. A lecture by Wm. Elliott Griffis. *With Map.*

Mr. Griffis's statement that he has never been in Korea will surprise many readers; but his paper here given will confirm the opinion he expresses, that a knowledge of the language and literature of a country is in some cases more valuable than a superficial acquaintance with its scenery.

Korea. **Miln.**
Quaint Korea. By Louise Jordan Miln. London: Osgood, McIlvaine & Co., 1895. Size 8 × 5½, pp. viii. and 306. *Price 5s. Presented by the Publishers.*

A collection of newspaper articles and other lightly written essays on a visit to Korea.

Luchu Islands. **Chamberlain.**
The Luchu Islands and their Inhabitants. By Basil Hall Chamberlain. (From the *Geographical Journal* for April, May, June, 1895.) Size 10 × 6½, pp. 58. *Map and Illustrations.*

Malay Archipelago—Celebes. *Z. Ges. Erdk. Berlin* 30 (1895): 226–234. **Sarasin.**
Reiseberichte aus Celebes von Paul und Fritz Sarasin. II. Bericht. *With Map.*

Philippine Islands. *Globus* 67 (1895): 334–337. **Blumentritt.**
Ueber die Namen der malaiischen Stämme der philippinischen Inseln. Von Ferd. Blumentritt.

Philippine Islands. *M.G. Ges. Wien* 38 (1895): 228–248. **Blumentritt.**
Neuere Werke über die Philippinen. Von Ferd. Blumentritt.

Philippine Islands—Seismology. **Masó.**
Observatorio de Manila. La Seismologia en Filipinas. Datos para el Estudio de Terremotos del Archipielago Filipino reunidos y ordenados por el P. Miguel Saderra Masó. Manila, 1895. Size 12½ × 8½, pp. 122. *Maps and Plates. Presented by the Meteorological Observatory, Manila.*

Illustrated by numerous earthquake maps of the islands, and several seismograph tracings.

Palestine—Jerusalem. **Whitty.**
Discovery of "Whitty's Wall" at Jerusalem (King Solomon's Rampart). With Map. By Rev. John Irwine Whitty, LL.D., etc. London: Simpkin & Co., 1895. Size 9 × 5½, pp. 18. *Presented by the Author.*

Siberia—Tundra Rock-ice. **Toll.**
Wissenschaftliche Resultate der von der Kaiserlichen Akademie der Wissenschaften zur Erforschung des Janalandes und der Neusibirischen Inseln in den Jahren 1885 und 1886 ausgesandten Expedition. Abtheilung III. Die fossilen Eislager und ihre Beziehungen zu den Mammuthleichen.

Von Baron Eduard v. Toll. [Mémoires de l'Acad. Imp. des Sci. St. Pétersbourg, VII^e Série. Tome xlii. No. 13.] St. Petersburg, 1895. Size 13½ × 10, pp. viii. and 86. *Plates.* *Presented by the Author.*

A thorough study of the conditions of the ice in the tundras of the extreme north of Siberia, in five chapters. (1) Summary of previous knowledge regarding "rock-ice." (2) Rock-ice and its conditions in Janaland. (3) Rock-ice in the New Siberian Islands. (4) Fossil glaciers. (5) Conclusions relating chiefly to the problems arising from the preservation of mammoth-remains in rock-ice.

Western Asia—Ethnography. **Brinton.**

The Protohistoric Ethnography of Western Asia. By Daniel G. Brinton. Read before the American Philosophical Society, April 19, 1895. Philadelphia, 1895. Size 9 × 6, pp. 32. *Presented by the Author.*

AFRICA.

British East Africa. **McDermott.**

British East Africa, or *Ibea*. A History of the formation and work of the Imperial British East Africa Company. Compiled with the authority of the Directors from official documents and the records of the Company. By P. L. McDermott. New Edition. London: Chapman and Hall, 1895. Size 8½ × 5½, pp. xx. and 632. *Map, Portrait, and Illustration.* *Price* 6s. *Presented by G. S. Mackenzie, Esq.*

This edition carries on the history of the I.B.E.A. Company down to the date of the transfer of the Company's administration and property to the British Government, and so forms a complete history of an important episode in the development of Africa.

East and Central Africa. *Verh. Ges. Erdk. Berlin* **22** (1895): 270–295. **Neumann.**

Herr Oskar Neumann: Bericht über seine Reisen in Ost -und Central-Afrika. *With Map.*

Egypt. **Marriott.**

The Situation in Egypt. By Right Hon. Sir W. T. Marriott. From the *Fortnightly Review*, April, 1895. Size 10 × 6½, pp. [16].

Egypt—Ancient Masonry. **Schweinfurth.**

Ein altes Stauwerk aus der Pyramidenzeit. Von Georg Schweinfurth. [Illustrierte Deutsche Monatshefte.] [1895.] Size 10½ × 7, pp. 10. *Illustrations.* *Presented by the Author.*

Ethiopia. **Chaurand.**

Corpo di Stato Maggiore. Elenco generale Alfabetico dei nomi contenuti nella Carta dimostrativa dell' Etiopia compilata dal Maggiore E. de Chaurand. Roma: Stabilimento Civelli, 1895. Size 10½ × 7½, pp. 114.

Index to the new Italian map of Ethiopia.

French West Africa—Dahomey. *Abrégé B.S. Hongroise G.* **22** (1894): 66–78. **Tinayre.**

Onze mois au Dahomey (Mai 92—Mars 93). Par Abel Tinayre.

French West Africa—Porto Novo. *Rev. Scientifique* (4) **3** (1895): 593–598. **Marchoux.**

Porto-Novo et ses habitants. Par M. Marchoux.

French West Africa. *Rev. Scientifique* (4) **3** (1895): 459–465. **Monteil.**

Voyage au lac Tchad. Par M. P.-L. Monteil. *With Map.*

Madagascar. *Rev. G.* **36** (1895): 388–392. **Gaubert.**

Notre Carte de Madagascar. Par B. Gaubert. *With Map*

A clear, if somewhat rough, "war-map" of the island.

Sahara. *B.S.G. Paris* (7) **16** (1895): 10–74. **Foureau.**

Une mission chez les Touareg Azdjer. Par Fernand Foureau.

West Central Africa. *B.S.G. Paris* (7) **16** (1895): 5–9. **Maistre.**

Note sur la carte itinéraire de l'Oubangui à la Bénoué. Par C. Maistre. *With Map.*

West Africa—Borgu. **Lugard.**

England and France on the Niger: 'The Race for Borgu.' By Captain F. D. Lugard. From the *Nineteenth Century*, June, 1895. Size 10 × 6½, pp. [15].

West Africa—Nupé. *Rev. G.* **36** (1895): 328-337. **Béhagle.**

Le Noupé et les prétentions de la Compagnie royale du Niger. Par Ferdinand de Béhagle.

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Asia Minor. **v. Prittwitz u. Gaffron and v. Flottwell.**

Wege-Aufnahmen im Gebiet des unteren Qyzyl Yrmaq (Halys) Juli bis Dezember 1893. Aufgenommen und gezeichnet von v. Prittwitz u. Gaffron Premier-Lieutenant im Anhaltischen Inf. Regiment No. 93, kommandiert zur Kriegs-Akademie, und v. Flottwell. Premier-Lieutenant im Grenadier-Regiment Kronprinz Friedrich Wilhelm (2 Schlesisches) No. 11, kommandiert zur Kriegs-Akademie. Aus dem Originalmassstab von 1 : 100,000 reduziert auf 4 Blätter im Massstab 1 : 250,000 or 4 stat. miles to an inch. Petermann's 'Geogr. Mitteilungen,' Ergänzungsheft No. 114. Justus Perthes, Gotha, 1895. *Presented by the Publisher.*

AFRICA.

East Africa. **Kiepert and Moisel.**

Karte von Deutsch-Ostafrika. Scale 1 : 300,000 or 4·7 stat. miles to an inch. Construirt und gezeichnet von R. Kiepert und M. Moisel. 1 Mai

1895. Geographische Verlagshandlung Dietrich Reimer in Berlin, Hoefer & Vohsen.

This is another sheet of the map of German East Africa which is in course of publication. It contains the country between the southern end of Victoria Nyanza and Lat. 4° S., and from Long. 32° to 34° E. The principal routes of travellers, tribal boundaries, and numerous notes are given.

Transvaal. **Kitchin and Graydon.**

'The African Review' Map of the Witwatersrand District from Luipard's Vlei to Modderfontein. Compiled from official and other sources, by Joseph Kitchin and Newenham A. E. Graydon, F.R.G.S. (Editor). Scale 1 : 47,520 or 0·75 stat. mile to an inch. Published at the *African Review* Office, London. *Presented by Messrs. Will, Cannell, and Rider Haggard, Limited.*

This map will be useful to all persons interested in the Witwatersrand District. It shows the position and extent of mining claims, the position of the main reef, and the number of claims held by each company or individual.

Victoria Nyanza. **Brard.**

Originalkarte einer Forschungsreise auf der Sesse Insel. Aufgenommen u. gezeichnet von Pater Brard, 1893. Petermann's 'Geogr. Mitteiln.,' Jahrgang 1895, Tafel 11. Gotha: Justus Perthes. *Presented by the Publisher.*

AMERICA.

Mexico and British Honduras. **Sapper.**

Karte der Verbreitung der Sprachen in Südost-Mexico und Britisch Honduras ums Jahr 1894. Von Dr. Karl Sapper. Scale 1 : 4,000,000 or 63·1 stat. miles to an inch. Petermann's 'Geographische Mitteilungen,' Jahrgang 1895, Tafel 12. Justus Perthes, Gotha. *Presented by the Publishers.*

AUSTRALASIA.

New Guinea. **Brixen and Linnemann.**

Das Hinterland von Hatzfeldthafen (Kaiser Wilheim Land). Auf Grund der Aufnahmen und Vermessungen der Landmesser von Brixen und Linnemann entworfen u. gezeichnet v. P. L. Scale 1: 100,000 or 1·6 stat. mile to an inch. Langhans: Beiträge zur Kenntnis der Deutschen Schutzgebiete Bl. 9. Petermann's 'Geogr. Mitteilungen,' Jahrgang 1895, Taf. 13. Justus Perthes, Gotha. *Presented by the Publisher.*

Ancient Geography. **Sieglin.**

v. Spruner-Sieglin, Hand-Atlas zur Geschichte des Altertums, des Mittelalters und der Neuzeit. I. Abteilung: Atlas Antiquus. Atlas zur Geschichte des Altertums. 34 kolorierte Karten in Kupferstich, enthaltend 19 übersichtsblätter, 94 historische Karten und 73 Nebenkarten. Entworfen und bearbeitet von Dr. Wilhelm Sieglin. Vierte Lieferung. Gotha: Justus Perthes, 1895. *Price* 2 *marks* 5 *pf. each part.*

The present issue of this atlas contains—No. 6, Asia Superior; No. 22, Italiæ pars Meridionalis; No. 23, Roma urbs; No. 26, Imperium Romanum inde a bello Hannibalico usque ad imperatoris Augusti mortem. Numerous insets are given, and the maps are beautiful specimens of cartography.

GENERAL.

Meteorological. **Schott.**

Linien gleicher mittlerer Jahresschwankung der Temperatur des Oberflächenwassers der Oceane. Entworfen von Dr. Gerhard Schott, 1895. Petermann's 'Geographische Mitteilungen,' Jahrgang 1895, Taf. 10. Gotha: Justus Perthes. *Presented by the Publisher.*

School Atlas. **Ravenstein.**

Philips' Systematic Atlas. Physical and Political. Specially designed for the use of higher schools and private students. Containing 170 maps and diagrams in 41 plates, and a complete Index of over 12,000 names. By E. G. Ravenstein, F.R.G.S. G. Philip & Son, London, 1895. *Price* 10*s*. 6*d*. *Presented by the Publishers.*

The World. **Ravenstein.**

Philips' Handy Volume Atlas of the World. An entirely new and enlarged edition, containing seventy-two new and specially engraved plates, with statistical notes and complete index. By E. G. Ravenstein, F.R.G.S. George Philip & Son, London, 1895. *Price* 5*s.* *Presented by the Publishers.*

The World. **The "Times."**

The Times Atlas. Published at the *Times* Office, London. Parts 14 and 15. Complete in fifteen weekly parts. *Price* 1*s. each part.* *Presented by the Publishers.*

Part 14 contains the following maps: Southern France, a general map of Germany, Austria-Hungary, Central Asia, and India. Part 15 contains a map of the World on Mercator's projection, and three insets showing the British possessions and the commercial routes of the World, West Africa, Polynesia, Victoria, and New South Wales. With the issue of Part 15 this atlas is complete. Each part has been furnished with an index for all the maps it contains, and in addition to the principal maps, there are numerous insets. Taken as a whole, it is a useful atlas for general reference, and the cheapest, of its class, that has ever been published in this country.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, May and June, 1895. *Presented by the Hydrographic Department, Admiralty.*

No. Inches.
512 m = 3·91 Scotland, west coast:—Approaches to Stornoway. 1*s.* 6*d.*
510 m = 1·39 Norway, south-west coast:—Hisken to Toftö, including the southern channels leading to Bergen. 2*s.* 6*d.*
881 m = 2·6 Norway, west coast:—Urter to Hisken, including the entrance to Hardanger fiord and approaches to Haugesund and Lervig. 2*s.* 6*d.*
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935 { m = 1·32 } Africa, west coast:—Isles do Los (Idolos), Konakri road.
{ m = 4·75 } 1*s.* 6*d.*
759A m = 0·09 Madagascar, west coast:—Cape St. Andrew to Bevato island. 2*s.*
759B m = 0·09 Madagascar, east coast:—Antongil bay to Ambatosoa. 2*s.*
567 m = 3·9 Australia, south-east coast:—Jervis bay. 3*s.*
1160 Barnstaple and Bideford:—Plan added: Ilfracombe.
2360 Cape Falsterbö to Kalmar sound:—New plan: Rönne harbour.
2743 Rade de la Hougue:—Plan added: Port Barfleur.
1813 Port Paita to Ayangui point:—Plan added: Zorritos.
1915 Anchorages in Alaska:—Plan added: Lazy bay.
1227 Cape Spartel to Azimur:—New plans: El Araisti Rabat and Sali.
935 Harbours and anchorages between Bali and Timor:—New plan: Bima bay. Plans added: Coaling station anchorage, Waingapu road, Koepang road.
1236 Approaches to Port Arthur:—New plan: Port Arthur.
1316 Cape Duroch to Linden point:—Plan added: Vitiaz bay.
991 Anchorages on the coasts of Yezo island:—Plan added: Bokkiriso bay.
1473 Rossel island and lagoon:—Plan added: Pwenegwa harbour.
2169 Islands in the North Pacific:—Plans added: Necker island, Nihoa or Modu Manu (Bird island).

Charts Cancelled.

No.		Cancelled by	No.
1158	Ilfracombe harbour.	New Plan. Ilfracombe on sheet	1160
881	Approaches to Haugesund.	New Chart. Urter to Hisken, etc.	881
562	Port of Valencia.	New Chart. Port of Valencia	562
1304	Port San Pedro, Sheep, and Small coves.	New Chart. Plans on the coast of Chile	130
565	Tictoc bay.		
566	Comau or Leteu.		
1305	Mocha island.		
759	Cape St. Andrew to Bevato island. Antongil bay to Ambatosoa.	New Charts. Cape St. Andrew to Bevato Island Antongil bay to Ambatosoa	759A 759B
2176	Plan of Jervis bay on this sheet.	New Chart. Jervis bay sheet	567
1160	Plan of Barnstaple bar on this sheet.		
2456	Muskeget channel.		
935	Plans of Labuan Tering bay and Nangamesi bay on this sheet.		

Charts that have received Important Corrections.

No. 117, North Atlantic Ocean:—Færoe islands. 1772, Ireland, south coast:—Approaches to Wexford harbour. 2309, Norway, west coast:—Leka to Donnæsö. 2338, Lapland:—Varanger fiord to Mal Oleni. 2623, Maltese islands:—Comino channels. 1659, Mediterranean:—Lemnos islands. 2890, North America, east coast:—Nantucket shoals to Block island. 2544, South America, east coast:—Rio de la Plata. 1749, South America, east coast:—Monte Video to Buenos Aires. 758, Madagascar, northern portion. 2762, Indian Ocean:—Comoro islands. 942A and 942B, Eastern Archipelago, eastern portion. 934, Eastern Archipelago:—Surabaya, Bali and Sapudi straits. 2657, Japan:—Gulf of Tokyo or Yedo. 2432, Russian Tartary:—Tumen Ula to Stielok bay. 2122, New Guinea:—Round head to Orangerie bay. 2123, New Guinea:—Orangerie bay to Bramble haven. 2423, New Guinea:—Boigu island to Cape Blackwood. 960, Tasmania:—Approaches to Hobart. 1510, Pacific Ocean:—Sandwich islands.

(*J. D. Potter, Agent.*)

United States Charts. **U.S. Hydrographic Office.**

Pilot Charts of the North Pacific Ocean for July and August, and North Atlantic Ocean for July, 1895. Published monthly at the Hydrographic Office, Bureau of Navigation, Department of the Navy, Washington, D.C. Charles D. Sigsbee, Commander U.S.N., Hydrographer. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

East Africa. **Benett-Stanford.**

Album containing 19 Photographs of East Africa, taken by J. Benett-Stanford, Esq., in the neighbourhood of Lamu, Tana River, etc. *Presented by J. Benett-Stanford, Esq.*

This album contains a very fine set of photographs of camp scenes and natives, taken by Mr. J. Benett-Stanford during his travels in East Africa.

U.S. of Colombia. **Gledhill.**

69 Photographs of the U.S. of Colombia, taken by Edward Gledhill, Esq. *Presented by Edward Gledhill, Esq.*

This series contains a number of photographs that have been well chosen to illustrate the scenery of Colombia, and the everyday life of the people. As we have very few views of this portion of South America, Mr. Gledhill's donation is a valuable addition to the Society's collection.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

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EXPEDITION TO RUWENZORI AND TANGANYIKA.*

By G. F. SCOTT ELLIOT, M.A., B.Sc., F.L.S.

My application to the Royal Society for funds for a visit to Ruwenzori was based on the supposition that I would start from the Zambezi and proceed along the Shiré and Lake Nyasa to Tanganyika, and thence make my way to Ruwenzori (where I proposed to remain four or five months), returning by Uganda to Mombasa. The Royal Society, however, in granting it, requested me to start from Mombasa, which I left on November 6, 1893.

I had rather more than the usual difficulties in starting, as the headman was obviously doing his best to spoil the expedition. I therefore discharged him during the first fortnight, and found things much better, though the want of a single trustworthy man caused me great loss further on.

The journey from Mombasa to Uganda by the ordinary route has been so often and so well described that I shall not dilate upon it. As is well known, the first part of the route to Nzowi crosses an almost waterless thorn-tree scrub, which may be considered almost valueless, although I think that ostrich farms might be carried on with a fair prospect of success. The country after leaving Nzowi—that is to say, Ukamba, Kikuyu, and the Masai country as far as the Nandi range—is, however, of a very different character. The fertility of Ukamba and Kikuyu has been very clearly proved, but the value of the Athi plains and Masai country has not been so clearly pointed out. I have always found that an abundance of big game implies a fertile soil, *i.e.* in all probablity a good grazing country, and I do not think that game could be more abundant than it is along this route. Some suppose, on the other hand, that these enormous grassy steppes must be bad because there are no inhabitants save a few wandering Masai. I had, however, the rare experience of seeing Masai kraals on the march. My camp at the first Kidong, *i.e.* halfway between Kikuyu and Lake Naivasha, was surrounded by numerous Masai kraals. The grass everywhere had been eaten down to the ground (scarcely one blade of grass being 2 inches long), and next morning, when I and they started, it was quite impossible to count the herds of cattle and flocks of sheep, goats, and donkeys which accompanied them. Seeing this enormous quantity of animals collected at one spot, one ceased to be surprised either at the shortness of the grass or at a camp being unable to remain for more than perhaps ten days in one spot. In fact, the enormous number of animals is a strong proof of the fertility of the soil, and also fully explains the outbreak of cattle disease, etc.

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* Paper read at the Royal Geographical Society, April 8, 1895. Maps, p. 400.

The healthy character of the district admits of no doubt whatever, so that I am strongly of the belief that this country, *i.e.* from Nzowi to the Nandi range, may be in time a most valuable British colony.

Before leaving the Masai, I should like to point out how very easy it would be to subdue them. If the kraals are kept under supervision, the Elmoran who live upon them could be kept in order too, and nothing could be more easy than to watch these enormous encampments. When moving, the herds of different people are kept apart, following one behind another, and driven chiefly by boys and women. The donkeys carry the hides which form their tents, and the sticks on which these hides are stretched are trailed on either side of the animal, apparently to keep its load in position. Some of the younger women are almost unable to walk through the abundance of rings which they carry. There is a very large number of sick people, and all sorts of stragglers, particularly old and feeble women, are found far behind the rest. The caravan I saw must have extended nearly 10 miles.

After crossing the Nandi range, one enters the Nyanza region, which seemed to me to consist of gneiss or granite, usually in small lumpy hills. This region embraces Kavirondo, Busoga, and Buganda, as well as a large part of Ankole. It seemed to me to reach right to the base of Ruwenzori, and seems to be a plateau of 3900 to 4300 feet altitude. The north-western part of Ankole, as well as most of Karagwe, consists of a series of schists folded over and over at a very steep dip, and with an average strike of north-north-west; these appeared to me to overlie the gneisses of the Uganda plateau, as both on entering the Karagwe hills at Butunguru, and leaving the Ruampala (of Ankole) at Kitagwende, the difference in character of the rocks was most obvious.

Of the countries forming our territory in the Nyanza region, I formed a very high opinion. Uganda is not by any means superior to Usoga and Toru, though these latter have for a long time been subject to it. Our Government seems to wish to confine our administration to Uganda itself, and this seems to me most unfortunate.

A part of these Nandi rocks which crop out near Berkeley bay contains deposits of what seems to be a valuable iron ore probably worth exporting or working for the ochre it yields. It is a very primitive mine, consisting of small holes some 6 feet deep and wide, in which the natives scrape out the iron, which is then carried in baskets to their village about 3 miles off, or sometimes to a fair on the borders of Usoga, where it is exchanged for bananas. A similar deposit exists near the Sekibobo's town in Uganda. These ironstones are so close to the lake that they may become very valuable in time. Any timber required for them could be brought from some of the heavily wooded parts of the Nyanza.

THE BAMBOO ZONE ON RUWENZORI.

The Uganda plateau has been very much before the public for some years, but its value in the future does not seem to have been clearly realized. It has been, for instance, proved that wheat, with a little care, can be grown in enormous quantities. The native coffee is most excellent, and never receives any care whatever. Bananas, tobacco, sweet potatoes, and all kinds of European vegetables, grow very well indeed. Cattle and sheep do well in most parts, though not in all. As regards plants which have not been so far tried in the country, the numerous marshes ought to form excellent rice-fields, and there are places where tea could probably be produced. In fact, it is not, I think, too much to say that the countries bordering the Victoria may become, with English enterprise and perseverance, one of the most important food-producing centres in the world.

It is not easy to see what might not be done with the banana. The French fathers, I found, manufactured brandy, champagne, and beer from the fruit, which also supplied them with bread and jam. The natives thatch their houses with the leaves; I have even seen the leaves, when split, used as clothing.* A single leaf forms an umbrella or a cradle for the baby. Add to this the intelligence of the race and their extraordinary desire for all articles of European manufacture, and one begins to realize what a magnificent possession is in our hands.

Here Captain Gibb, Acting Administrator, most hospitably entertained me, and on parting gave me everything I could desire. I cannot sufficiently thank him for his many kindnesses. I found that a journey to Elgon was, under the circumstances, out of the question, and after waiting a month for news, I went on through Buddu to the Kagera. As I could not go across to Ruwenzori with Kabbarega's people between, I thought I would try and see if the Kagera was navigable, and strike across Ankole.

I left Kampala on February 20, and travelled through Buddu to Kitangule. This journey by land is most trying. Some of the swamps take a caravan four hours to cross, and there are very many of them. After crossing the Kagera at Kitangule, I followed its course as closely as convenient till entering the Karagwe hills, already mentioned, at Butunguru. I crossed it again at Kitoboko, not very far from the spot where it was crossed by Stanley. I then went over the Ankole mountains by a new route, touching that of Stanley's expedition at two or three places. There is some amount of error in most maps of Ankole. I found the Katara swamp to be connected with the Wamaganga swamp, mentioned by Stanley, and it is from this that the Ruizi or Bukola river takes its rise. This river I also found to expand into a series of broad lakes, and finally to make its way right down to Buddu, where it falls direct into the Victoria Nyanza, not joining the Kagera. I was able to locate pretty closely the position of Antari's capital, though this potentate objects to any European visiting him. The people are very different in character to the Waganda. They are a very sulky, obstinate race, both men and women almost always smoking. Their clothes consist often of absolutely nothing but a goatskin hung across the shoulder.

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* An enormous number of split leaves forming a voluminous skirt.

Every man carries a spear, which he seldom lays aside. They wear bangles of wire or beads on arms and legs, and usually necklaces of amulets or leopard's teeth. Many have rings of hippopotamus-hide. They are also a treacherous and cowardly race. An unfortunate porter of mine wandered out of camp one night to drink beer with the natives, and never appeared again. I was travelling with one of Antari's big chiefs, and, as I could not find out who had done this, and Antari had done all in his power for me, I thought it best to go on and leave punishment to him.

These people seem to raid Koki, Mpororo, and the colonies of Ruanda to the west, from which, I think, they derive a certain amount of Wanyuema, or rather Waruanda, blood. They have never beaten the Waganda, and in fact the latter hold them under control. Some of the higher chiefs seem to be Wahima. The country is very poor, though in some places, *e.g.* Mavona, there are vast banana plantations. There is plenty of iron, but a scarcity of timber.

BUTAGU VALLEY, RUWENZORI.

On March 29, 1894, after toiling up one of the stoniest passes of the Ankoli hills, I caught a glimpse of Ruwenzori across the broken lumpy plateau of Kiarutanga. Next day I was prostrated on the march by a severe fever, and on the 30th I was carried down to the shore of the Albert Edward. That afternoon I had the most exquisite view of Ruwenzori which I ever had, and I really think the finest landscape I have ever seen. A great distance across the silvery waters of the lake, the whole mass of dark blue mountains from the Salt lake to Kasagama's was clearly revealed. A small strip of white cloud stretched across them, and the sharp and jagged ridges of the mountains with a few glittering peaks of snow were clearly outlined against the bright sunset sky. The sun had just set behind the chain.

The following night was enlivened by extraordinary swarms of mosquitoes and a rhythmical chorus of frogs. Next morning canoes arrived from Kuliafiri, and we proceeded to his village, first crossing the Nyanza and camping; then over the alluvial plain (the old lake-level) to near the Nyamwamba river. I then went up the Mubuku river and pitched a camp at Komokoro's, where I remained five days trying to get rid of my fever. One of the minor effects of Kabbarega was the presence of numerous leopards. One very dark evening one of these seized a porter and wounded him very badly. It then attacked the camp and seized another man, who was hurt very severely indeed. I had to sew up their wounds by candlelight with an ordinary needle and thread.

I found that this camp, although a most lovely situation—for one could see up the forest-clad Mubuku valley to the very base of the snow-peaks—was untenable owing to the difficulty of obtaining food. Either this valley or the Hima, which I did not visit, would, I think, be the best for attempting to ascend the mountain. It would be necessary to cut a path through the forest, and straight up the northern side of the Mubuku. I thought it best, therefore, to go on to Kasagama to obtain an agreement with him as to supplies.

After a short visit to Kasagama, whom I found disposed to promise everything and carry out nothing, I returned towards Butanuka, and, after much trouble (through the natives leading me astray of set purpose), I pitched my camp at Kivata, near the head of the Msonje river, at an altitude of 6610 feet. I suffered greatly from fever, but during the intervals managed to investigate pretty thoroughly the floral regions, and found a path which leads over to the Wawamba country. By following this path I got to the summit, at this point only 10,060 feet. After this disappointment I transferred my camp to the next valley, the "Yeria," and made many trips about the forest and in the bamboos. The natives, by Kasagama's orders, misled me as much as possible; but I managed eventually to get out of the forest to the top of the mountain here, and had, in an interval of the mist, a glance at the Semliki valley. The height, however, was only 10,640 feet. I then went on to the next valley, the "Wimi," where rain fell almost continuously. I made several attempts to reach the summit; but at last there was a fine day, and I saw sufficiently clearly that the snow was still far away to the south-west. I had been misled by my map, which represented the snow-peak as close to Butanuka, from which Captain Lugard probably saw them; but they are a long way to the west-south-west. Captain Lugard's map is, however, wonderfully correct, and was of great use to me.

About this time a scare had taken place at Katwe, the Salt lake, and I received frequent messages from the Swahili in charge of it asking me to come. Kasagama had, immediately after he was restored, sent an army under charge of his mother to punish several chiefs who had not assisted him against Kabbarega. But these were under British protection, and had greatly helped our Swahili garrison at the Salt lake. I also heard a body of 300 men, the Wanyuema, were raiding the neighbourhood. Of course, Kasagama's mother and her army at once fled in all directions at this news. On arriving at the Salt lake, I found that 30 Wanyuema had indeed come to buy salt. After a great deal of trouble I managed to smooth things over for the time, and went on towards the west side of Ruwenzori, intending to reach the Kakola peak, where the snow seemed to be close to the outside of the mountain. I managed to get to the Butagu valley, and made a camp about 5530 feet; from this I explored the country, and found a very bad path up the river leading towards the centre of the mountain. I took ten men with me, and stores for three days, and went up this path, sleeping at the last hut on the road. Next day we camped at about 9440 feet, all the water being wrung out of sphagnum roots. The day after I intended to carry up provisions and sleep at about 13,000 feet, but to my great disgust my men became knocked up at once, and I had to content myself with going on to 12,640 feet, and then coming back to camp in the evening. I suffered severely from breathlessness, and two men out of ten were quite invalided by this. On my return to the general camp I had a severe

RUWENZORI, BUTAGU VALLEY.

fever, which kept me laid up three days. I had intended to return to the valley when well, but on July 11 some of the natives attacked three of my men, and I did not consider it safe to be a week away from my small party in a hostile country. I therefore had an interview with Tengetenge—who had, of course, run away, and would only come to see me with an escort of 100 warriors—and returned to the Salt lake.

I got there on July 22, and found my supply of cloth was running very short, so I determined to make one other attempt to ascend the mountain. I left the main body at the Salt lake to recruit, and went with a small party to the Nyamwamba valley. On this occasion I succeeded in getting two men with a few stores and a tarpaulin bag to 9600 feet, and sent them back to the nearest village. I slept the next night in the bag, and next day made my last attempt. I found mountain sickness very trying, but reached 11,140 feet by boiling-point thermometer at 12 p.m.; then a heavy shower of rain came on, and after trying for three hours to get higher still, I was eventually obliged to turn back and get down the mountain, walking in a fever. On this occasion I reached, however, the central core of the mountain, of which I took a specimen home. The conclusion I came to was that a practised mountaineer and a strong man could manage the ascent. I do not believe any peak I saw was above 16,500 feet.

Of course, having such a very small number of men, I was obliged to be very careful of them; but it would be possible to get Swahili to carry stores for one night to 13,000 feet, and then to ascend the next day and return to 10,000 feet or so, though I could not have done it. My attempts were therefore unsuccessful in this respect. On the other hand, I managed to get together a fairly representative collection of the flora up to 12,000 feet. The mountain is very curious, and particularly in the steepness of the latter portion, but its general shape is difficult to show on a vertical section given.

I found the climate of Ruwenzori a peculiarly trying one in most spots. Up to 5000 feet one is quite as liable to fever as on the Uganda plateau, or even more so. At about 7000 feet the perennially humid forests begin, and even at this height in the bottom of the valleys, *e.g.* in my camp at the Wimi valley, one scarcely had an hour's sunshine, and everything was permanently humid. This wet condition prevails up to the height of at least 13,000 feet. Hence it is only on projecting bluffs or ridges at about 6000 feet that one has at all a dry climate. On a few favoured spots such places are really magnificent, and one enjoys excellent health. I am bound, however, to say that I saw no spot to be thoroughly recommended as a sanitarium.

The most curious feature of Ruwenzori is the white cloud which envelops the upper mountain. In the morning this cloud is at an average level of about 7000 feet, but is very much lower in the valleys, sometimes descending to 6000 feet. It is also lower at the north and south ends of the chain, where the mountain itself is not so high. The forest follows the average level of the cloud most closely, descending lower in the valleys and also to north and south in the same way. It seems to me pretty clear that the moisture-laden winds, after passing over the swamps of Uganda and Victoria, are intercepted by the mountain and there condensed.

The peculiar feature of Ruwenzori, however, is the manner in which the cloud rises. Beginning about 10 a.m. to ascend, it slowly climbs upwards all day, and eventually vanishes away about 5.30 p.m., when one gets the only chance during the day of seeing the snow-peaks. This seems to me to be due to the mountain becoming more rapidly heated by the sun than the plains below, leading to an upward current of air. At about this time (5.30) the whole mountain-side is strongly heated, and this explains another curious feature of the mountain. In those valleys which lead directly to the base of the snow-peaks, *e.g.* the Mubuku, Wimi, and Butagu, an extremely violent wind (almost a hurricane) blows down the mountain from about six to seven, then dying suddenly

BUTAGU RIVER AND WILD BANANAS.

away to nothing. This is simply the cold air from the snow rushing down to the heated lower slopes. This wind does not occur on evenings when there has been rain on the lower parts, which is what one would expect. Sometimes at the same moment there are, in an upper current of the atmosphere, clouds moving towards the upper peaks. Of course these conditions make all kinds of work, and especially mapping, very difficult. It is almost impossible to know where one is, and it was not till I had been more than five weeks about the Yeria and Wimi valleys that I discovered that the snow-peaks lay several miles to the south-west, and much nearer the western sides of the mountain.

The various details as to the courses of the different rivers will be better shown on the map than by description. The geology is very interesting indeed. The core of the mountain seems to consist of a very coarse-grained plutonic mass of an elliptic shape. From this on all sides the schists and epidiorites dip down at a steep angle, so that their strike is quite different at different points, being, in fact, that of the tangent to the ellipse. Quite outside these ancient volcanic rocks, I came across a most curious series of little apparently much more recent volcanoes. The first of these is at Vijongo, where there is a perfect little chain of craters and lakes approximately at right angles to the tangent of the ellipse. Another crater lake occurs at Kyatwa hill (Butanuku). There is a hot spring in the Wimi valley, and a salt spring at the Muhokia. One again finds a crater-lake at Chukarongo. There are two more about half-way between this and Katwe, where the Salt lake itself is composed of three craters united in one, and another lake just before Katwe also seems to be quite similar. In all these places I found the lines of the volcanic material arranged as if dipping away from the centre, as one would expect.

So far as one can state it without going too deeply into scientific terminology, the mountain appears to have been formed by a thrust or wrinkling of the Earth's surface, the effect being to double up and protrude the mountain mass of Ruwenzori, while it formed the corresponding hollow in which now lies the Albert Edward Nyanza. This involved lines of weakness or cracks, along which at a much later date the volcanoes at Vijongo and about the Salt lake were produced. As to the glaciation, I fancy that the Nyamwamba and Mubuku valleys must have been once occupied by glaciers down to about 5500 feet. It is also possible that the Butagu valley may have been occupied by one. I gathered this from the *roches moutonnées* in the former two, as well as from their broad open U-shape, which is very different from the typical V-shape of the Yeria and other valleys to the north. There are also large accumulations of boulders and gravel in the two last, which seem to me now to be morainic. Dr. Gregory has most kindly assisted me with these rocks and geological questions.

The Uganda plants cease for the most part at 5400 feet, from which level to 7400 feet there is a curiously distinct flora. From 7400 to 8600 feet there is a true forest containing many curious forms. From 8600 feet to 10,000 feet there is a zone of bamboos, particularly on the eastern side. Above this level, 10,000 feet, there is a regular sphagnum peat-moss, in which one often sinks to the knees. Sometimes this is covered by a wood of stunted gnarled trees of heather festooned with grey lichens. In the more sheltered ravines one finds these trees of heather growing to an enormous size, often with a diameter of 2 feet! There are also tree Senecios, tree Hypericums, the arborescent *Lobelia Stuhlmanni*, which is 7 to 8 feet high, and quantities of brambles, which are often as big as mulberries.

PLAINS OF THE ALBERT EDWARD NYANZA.

Amongst the heather in the bare places, at about 10,000 feet, one finds an abundance of the delicate *Viola abyssinica*. There are also *Cerastium africanum*, Cardamines, Forget-me-nots, Epilobiums, and a variety of beautiful orchids. Amongst these one finds quantities of little blue butterflies as well as Acræas, and very numerous large Bombylid flies and small Hymenoptera. Of the insects collected there, I have had no information as yet, but in general they greatly reminded me of the Cape Colony. These Ericas, etc., extend at least to 15,000 feet. One of the higher plants not seen below 12,000 feet, is a very beautiful silvery Ladiesmantle, *Alchemilla Stuhlmanni*.

The most interesting point of the flora is the way in which its plants are allied to the most different regions. The Abyssinian affinity is a very marked one, and this explains why many Ruwenzori plants are found also on Kenia and Kilimanjaro — the ancestors of all these mountain floras having undoubtedly come from the mountains of Abyssinia. The Uganda and Ankole series of plants surround the base of the mountain, and reach only up to about 5400 feet.

The plants of the great Congo and West African flora also extend up to Ruwenzori, and particularly in the more moist and heavily wooded valleys, and a considerable number of new species seem to have arisen from plants originally belonging to this region. The total number of my collection amounts to 2700, and it is, of course, too rash to generalize further until these have been named.

Elephants are very numerous from Kasagama's to Chukarongo, where I once saw a hundred in single file. Along this eastern side the Kobus Kob and a water-buck, as well as the small *Thomsonii*, are common. I am inclined to think the water-buck is neither the common species nor the Singsing, but I had no means of verifying this. In the forest I once saw what seemed to be a bushbuck, and there are both a Colobuso monkey and, I think, two other kinds. I found also a common squirrel, but in most parts one is struck by the absence of animal life. A pretty little Nectarinia ascends to 11,000 feet, where it lives chiefly on the honey of a large white Acanth.

Before leaving the mountains, I should like to say a few words as to the people. Those on the west side are chiefly Wawamba, who file their front teeth, and in language and customs approach the Wanyuema of the Congo. They are a cowardly and treacherous race, constantly fighting with one another, and not under any real control to any one. Their clothing consists of a tuft of bark-cloth and a string round the waist, but some wear goatskins. They are fond of anointing their bodies with castor oil; armlets and anklets of brass wire and beads are very common. Whenever one approaches their villages, every soul promptly flies to the hills. They can scarcely be blamed for this, as their experience of strangers has developed a hereditary instinct to bolt to the mountains like a rabbit to its burrow on the least alarm. When one wants to communicate with them, one has to go unarmed, and hold out beads to the boldest and most inquisitive, till after several little panics they can be induced to come to the camp, when they proceed to beg for everything they see. If I took a guide into the mountains (where he would never dare to go alone), he wanted to steal everything he saw. Villages 3 miles apart are never visited, except with a large party of warriors. They are as much afraid of their own chief Tengetenge as of any one else. When his messengers came to see me, not a soul remained within 3 miles of the camp. Thirty of them attacked three of my men who were sent to hunt butterflies, but fortunately the wounded man recovered.

The Wakonja who inhabit the recesses of the mountains on the eastern side are a much pleasanter race. They are supposed to be under Kasagama, and are more friendly and a better people altogether. Their language seems to have no Wanyuema traces, and they do not file their teeth. They usually wear a monkey-skin pouch on the back, and are very industrious, particularly the women.

According to the arrangement supposed to be in force when I was there, Kasagama has a sort of supremacy over all the people on Ruwenzori. To this he has not the slightest claim, for the people on the west and south are liable to continual raids from the Semliki people, and he cannot protect them. He makes use of this supremacy simply to go and collect their cattle for himself, and does nothing for them.

EUPHORBIAS IN THE ALBERT EDWARD REGION.

These people on the west had been raided about three times during the four months preceding my visit. The suffering and destruction from one of these raids can scarcely be estimated unless one has seen the effects of it. On the east, where Kabbarega had been, scarcely a fowl or goat was left in the country. In the mountains I have come across the shelters in which these poor people lived, watching the destruction of their property by the Wanyoro, and stealing forth at night at the risk of their lives to get food. In one of these places, over 10,000 feet, thirty-seven people died of cold and exposure during this period. Women, of course, are seized and sold into slavery, and no formation of property is possible.

All along the west side the people everywhere begged and prayed me to be under the white man, and Kasagama himself also is very anxious for white men to settle in his country.

All the suffering and oppression of these poor wretches could be avoided by establishing two Europeans (strong men), with perhaps 150 Waganda soldiers, on the mountains. The cost of this might be £1500 a year, of which a great deal would be paid back by ivory and salt. Surely, in view of the blessing such an establishment would be, a rich nation like ourselves might afford it.

As it is a matter of some importance to know the best positions from which Ruwenzori could be administered, I might suggest that one of the projecting bluffs, at about 6000 feet on the Yeria valley, or between that and the Wimi, would, I think, have great advantages. The essential points of a station are its being healthy for Europeans, its being near a cultivated area, and in a position from which one can command a large extent of country.

Now, the most cultivated part of Toru is about Butanuka, and the valleys from the Nyamwamba on the south to Kasagama's on the north could be easily enough administered from a point on the Yeria valley.

At an altitude of 6000 to 7000 feet, on the ridge of the left bank of the Yeria, one could find a bare, fairly exposed spot, which would be on a road that leads over to the Semliki valley. This would also be within an easy distance, but not too near Butanuka and Kasagama's, and also close to the forest, and with plenty of bamboos and bananas at hand.

A station at this point would command the whole eastern side of Ruwenzori, and the north-eastern side could be kept under some sort of control.

There is no cultivation worth mentioning between the mouth of the Nyamwamba and the Salt lake, so that one could from another station at Ambambe or Karimi manage the Salt lake and the whole western side of Ruwenzori, as far north as may be found convenient. I suggest Karimi or Ambambe, as they are near the south side, and the raids of Wanyuema seem to come more from the south-west than directly from the west. It is very important that a European should be stationed at a high altitude, and also on a bare exposed hillside, for it is absolutely necessary that he should remain in good health. Life at the Salt lake itself would be almost unendurable on account of mosquitoes and the heat. Swahilis should only be employed under the immediate superveillance of the administrator, and a force of Waganda soldiers would be the most satisfactory. Local labour could be recruited at a very cheap rate from the Wakonja. Allowing £400 a year each for two Europeans, the cost of these stations might be kept at perhaps £2000 a year altogether, or even £1500.

I left Katwe on August 3, and crossed to Kwakaihura. I then went by a road somewhat nearer the Albert Edward than Captain Lugard's across Mpororo to Latoma, on the Kagera. This country is in an unsettled condition, as the Ankole people often raid Mpororo. This latter country is now of very small extent, as the powerful chief Makowalli of Butumbi, who is apparently of Waruanda race, has greatly encroached upon it. The latter portion of the route is over a fine grassy country where there are plenty of cattle. The watershed between the river Rufue, which is said to fall into the Albert Edward, and the Kakitombo, an affluent of the Kagera, is exceedingly low, not more than 300 feet above Latoma, *i.e.* 4500 feet. This is a matter of great importance, as it means that, supposing the Kagera route is ever utilized, one could from this point easily reach the Albert Edward Nyanza.

After obtaining supplies, I started along the Kagera, following it to beyond Kisozzi, where I was obliged to turn to the east on account of the Karainji lake. After travelling along these enormous lake swamps, I at last emerged on Speke's beautiful Lake "Windermere," which is quite worthy of all his praises. I found no supplies were to be had on the Karagwe side of the Kagera, and, as in this part Mr. Stanley had been along its course, I turned more to the east, sighting eventually Urigi, and, after several days spent amongst the mountains of Buhimba and Kakaruka, I reached Bugufu, a country never before visited by Europeans. I crossed the Ru Vuvu at this point, and found it exactly the same as before, a fairly broad, rapid, and deep stream. I went through Bugufu, and then, turning westwards, got into northern Urundi.

This is a most difficult country, cut up by numerous swamps, which are separated by curious ridges often 1200 feet above the level of the swamps. It is well watered, extremely fertile, and densely peopled. Here I had the greatest difficulty in obtaining food. I was followed during every day's march by two or three thousand armed men, and expected a collision almost every moment. After obtaining guides from Mwezi, I at last reached the summit of the Kiriba mountains, where Mwezi's people departed, after I had told them I would shoot them if they came further.

During this most trying time my forty men behaved splendidly. At the beginning of Urundi one of my men was wounded (through his stealing food), and, after being carried three days, died on the way.

After descending these mountains, a very steep fall of 2240 feet in perhaps 2 miles (from 7900 feet at the summit to 5660 feet at Maboko's), I found myself in a most delightful country. The people were very friendly, and belong to a chief Kilimanyambi, who is independent, though much afraid of Mwezi. This country down to Tanganyika is extremely fertile, oil palms, banana, goats, etc., being abundant. It consists of the lower hills of the Kiriba range, and is watered by small affluents of the Rusizi river. The mountains from this point curve round to the west, so that probably they extend to the Kissigali Mfumbiro range. The lower hills on the west side of Tanganyika appeared to me to approach so close to them 20 miles north of this point (Maboko's) that the Rusizi must be a stream of comparatively small importance. After leaving Maboko's we reached Tanganyika in three days on September 28. That was fifty-five days from Katwe, of which I did not travel on seven days, and made very small marches on several occasions. In fact, I think the distance by the route I followed could be traversed easily in six or seven weeks.

I should like to point out, in regard to the question of connection between Tanganyika and the Nyanzas, that, so far as I could see, there is every prospect of the Kagera being navigable for boats and small steam-launches from certainly Bugufu, and probably a point within 60 miles of the north of Tanganyika, to the Victoria Nyanza. It certainly, from my own observations, must be so from Kitoboko downwards. The natives at Kitoboko at one time made me believe that there were rapids on its course between Latoma and Kitoboko. Both Mr. Stanley and Dr. Stuhlmann speak of cataracts at this point, but neither actually visited them (cf. altitudes). Now, the direct route from Tanganyika to the Albert Edward must almost inevitably lie over a very difficult country, as the Kiriba range and the upper waters of the Congo as well as Mfumbiro lie in the way. The people are also Waruanda. The easiest route from Tanganyika to the Victoria Nyanza would probably be by Tabora from Ujiji, but that is all in German territory, and also a long one. Now, I crossed from the Kagera drainage into that of the Urigi lake, and back into that of the Kagera, and each time must have passed over at least 6000 feet. Hence the nearest route from the north end of Tanganyika to the Victoria Nyanza is probably difficult (though the gradient is easy) and rather long. It therefore seems to me that, if the Kagera is navigable, it is by far the best route. There would be from the north end of Tanganyika a distance of, I think, 60 miles to the point where the Kagera is navigable. The river could then be followed to the bend at Latoma, where it is on the left bank in the British sphere, and from which there is probably an easy route to the Albert Edward. This route would therefore connect both the Albert Edward and Victoria with Tanganyika, and also the Victoria and Albert Edward with each other.

The advantages of this route are not immediately obvious, but are none the less very great. First, the cheapness of water-transport must inevitably beat down that of railways. The cost of 1143 hours' steaming of the University Missions steamer on Lake Nyasa amounted to £139 11*s.* 8*d.*—that is, between 2*d.* and 3*d.* an hour!

Secondly, a large part of the route is already organized. There are probably twenty steamers on the Lower Shire and Zambezi, and some eight or nine on the Upper Shire and Lake Nyasa. There is also one on Tanganyika.

The third and most important advantage lies in the relative value of the countries opened up. If one leaves out of count the Victoria Nyanza region, which would of course be opened by either route, the lakes route opens up the Shire highlands, the Nyanza region, the healthy Stevenson road plateau, and both the Congo State and German territory—at any rate that part which is near Tanganyika. Some appear to think that the fact of such a route assisting to develop German territory is in itself an objection to it, but with this reasoning I am not in sympathy. In addition to this, a connection could be easily made. First, by Kituta to Lake Moeru and Katanga; secondly, from the north-end of Tanganyika to the ivory country to the north-west; thirdly, from Latoma to the Albert Edward and Ruwenzori. Contrast this with the Mombasa railway of 657 miles, which opens up only the Masai highlands, Kikuyu, and Ukamba. The first 260 miles is through a desert, where perhaps twenty ostrich and merino goat farms represent the whole probable future development of the country.

The lakes route involves a line from Chiromo to Matope, say 120 miles, which will probably pay its expenses and interest at once; another 240 miles to Tanganyika, which will probably pay its local expenses in four years or less; another of 100 miles to the Kagera (and possibly a porterage on the Kagera), to connect the whole of the lake region; that is altogether 460 miles as against 657 of the Mombasa route. It is also a matter of the very greatest national importance that our southern possessions should be connected with the East African sphere. The Mombasa railway will inevitably isolate the two for all time. The most important thing now necessary is to send a boat down the Kagera river, or up it, from the Victoria.

I then came down Tanganyika in an Arab dhow (which I was lucky enough to find close at hand) to Ujiji, and from Ujiji (where I was most hospitably treated by the Arabs, particularly Sefu bin Rashid) I made my way down to Kituta, where I found myself again amongst my own countrymen, who treated me most kindly. Thence I came down over the Stevenson road by Nyasa and the Shire to the mouth of the Zambezi.

Before the reading of the paper, the PRESIDENT said: We have this evening with us Mr. Scott Elliot, who only left us a short time ago—a year. Now he has returned, after having gone over a very vast extent of country in Africa; and his paper, relating to one of the most interesting portions of Mr. Stanley's discoveries—Ruwenzori, will be extremely interesting.

After the reading of the paper, the following discussion took place:—

Mr. H. M. STANLEY: I am sure there can only be one opinion here this evening upon the merits of the address we have heard from Mr. Scott Elliot. I am sure all of you have been charmed, in the same manner as myself, with the exceeding modesty of the lecturer. Young travellers are generally not so modest; at least, I may say for myself that I was not so when I was his age. I felt exceedingly ardent, though humorous old gentlemen would generally put another construction on it. I agree with most of the things said, though on one or two points we happen to be at variance. I think he stated that the plateau between the Nile and Ruwenzori extends from 3900 to 4300 feet high. There is a gentle rise from the level of the lake, which is about 3850 feet, to an average level of about 4300 feet, and thence there is a gradual uplift as you proceed to the west towards Ruwenzori, until finally at the western border of the plateau the whole seems to tilt up into ranges of mountains, ascending northward and southward, forming longitudinal troughs between one range and another, and rising to perhaps 5000 to 7500 feet above the level of the sea. In his desire to explore new country, after his march to Ruwenzori, Mr. Scott Elliot travelled to the south to explore the Kagera. He goes through Buddu. All travellers to the south must travel through Buddu from Uganda, and on their way they generally cross the river called the Ruwezi. Speke crossed it first; I crossed it second. Since then a number of officers of the East Africa Company have crossed it, and each one has brought opinions of his own in regard to the course of that river. Native informants do not take the same views of the lay of the land. When I was on the Ruwezi river, I was told it did not flow direct into the Victoria Nyanza, but took a running curve to the Kagera, and thus flowed into the Nyanza. I ascended the Kagera from Nzungezi for about 6 miles, and found it a splendid deep stream between high banks. Mr. Scott Elliot, after crossing the Kagera, turned westward, and made for a certain bend near the elbow, where the Kagera turns from its south-easterly course, and towards the Nyanza. I think he stated that he estimated the height of Ruwenzori to be about 16,500 feet. He has ascended it himself as high as 13,000 feet; that is nearly 3000 feet better than poor Stairs of my expedition. Many here no doubt know that for centuries the altitude of Demavend was supposed to be not more than 16,000 to 18,000 feet; but of late it has been ascertained to have an altitude of 22,000 feet. Very modest estimates in like manner have been formed of Mounts Kilimanjaro, Kenia, and Mfumbiro. Many people guessed Kilimanjaro to be no higher than 18,000 feet; they put Kenia at a little lower altitude, and Mfumbiro was estimated by Speke and myself at between 9000 and 10,000 feet. Now Kilimanjaro is found to be 20,000 feet; Kenia, 18,500 feet; and Mfumbiro has been found by Count Gotzen to be 11,220 feet. The higher we ascend we increase our estimate, until finally on reaching the summit we know the correct altitude. Now, I suppose when the next traveller ascends to 15,000 feet, he will be apt to put Ruwenzori 2000 feet higher than the figures of Mr. Scott Elliot, until at last Mr. Conway or some other alpine climber will be able to give us the exact altitude. Of course I was exceedingly interested in the description by Mr. Scott Elliot. I suspect a disposition on the part of Mr. Scott Elliot to take my mountains of the moon southward to an extreme distance. I dare say you will remember some years ago, when I returned from my last expedition, I described to you how in the past centuries these mountains of the moon had been dancing a fandango right across Africa. I told you how in my school-days I used to see on the maps of Africa "Jebel Kumr" in large letters, which translated mean "Mountains of the moon," and which extended from the neighbourhood of the Gulf of Guinea to the Gulf of Aden. I fixed their southernmost point on the equator, and I practically said in my book, "Here I fix them eternally." I had been very particular in taking each day's latitudes, and I was sure that that range of Ruwenzori would not be able to cross the Albert Edward Nyanza without my permission; but unfortunately my very next successor has taken hold of them and transferred them without my permission 300 miles further south. That, of course, I am bound to protest against. Because a King of Urundi is called Mwezi, and Urundi is known as the country of Mwezi, Mr. Scott Elliot thinks that it may mean the country of the moon; but the name Jebel Kumr, or Moon Mountains, was known in the time of Ptolemy, even earlier, something like thirty centuries ago, many centuries before Urundi was inhabited. The Arabs obtained the name from the Egyptians and the Greeks. Captain Burton, when he went to Unyamwezi, jumped to the conclusion that that was the land of the mountains of the moon, because in Kiryamwezi *Mwezi* happens to mean "moon" in English. Now, Mr. Scott Elliot has found a chief of the name of Mwezi in Urundi, and therefore the hills of Urundi ought to be called the Mountains of the moon. I have known several men of the name of Mwezi. I had once a native porter of that name, and I suppose if there is a hill in his country it will be called the mountain of the moon. However, this is only a mild protest, and I am sure it will be taken in good part.

However, I recognize real honest geographical work on the part of Mr. Scott Elliot in the march back from Ruwenzori towards the Kagera, and from the Kagera towards Tanganyika. It is absolutely new work, and there I see the two best qualities of the explorer exhibited—first, the nosing quality, untiring inquisitiveness, a desire to know; and, secondly, the quality of perseverance. Nevertheless, when he begins to give his deductions, we part company. Having followed the Kagera for a considerable part of its course, he has come to the conclusion that it would be the best way for any mails, goods, or passengers destined for Uganda to take the roundabout Zambezi road. Well, with all my desire and good wishes for the prosperity and success of the African Lakes Company, I cannot go so far as to wish them prosperity at the expense of that British territory that stretches between Mombasa and the Victoria Nyanza. From Mombasa continuously through British territory is a land journey of 657 miles to the shores of the Victoria; 140 miles further will take the steamer right up to the north end of Murchison bay, and the passenger is only then 3 miles from the capital of Uganda. Well, now at 10 miles a day that would mean sixty-six days from Mombasa to the Victoria Nyanza, and two days more by boat to Murchison bay, the journey is ended in sixty-eight days. Mr. Elliot proposes we should send our goods, mails, and passengers down by the Zambezi route, up the Shire river, up the whole length of the Nyasa, across the isthmus, up the whole length of the Tanganyika to the sources of the Kagera, northward along the Kagera, running finally to the estuary, and then 100 miles or so to Murchison bay; that means 2500 miles of water navigation and 435 miles' land march against 657 miles of land march and 140 miles of lake navigation. But that is not all. From Mombasa it is 1220 miles to the Zambezi; you tranship there to the river steamer, and go by that to the foot of the Shire rapids; you tranship again to load your caravan, the caravan travels 100 miles, and you transfer the goods on board the Nyanza steamer for 370 miles; that steamer goes up to the north end of the Nyasa; then you transfer to a caravan for 240 miles; for the journey to the south end of the Tanganyika there is another transhipment; you go 370 miles to the north end of Tanganyika, and transfer again to the caravan that travels between the north end of the Tanganyika and the navigable waters of the Kagera; then the goods must be transferred to the Kagera, and, as I think there will be a portage there, they must have another steamer to Murchison bay. Then at all these transhipment places they must have stations, keep men, and a white officer to look after the goods. Allowing that all that would be easy so long as you are in British territory or international waters, when you come to the north end of Tanganyika you are in German territory; if you put your British officers to look after the goods, they will be under the orders of a German sub-officer, and that German sub-officer in the interior of Africa on a banana a day and water allowance will be subject to madness of some kind or another. He is not always free from fever, and the condition of the poor British officer I would not envy, because if you don't know what a German is when he has fever, I would suggest that you go to the Congo in order that you may learn. Well, there will be stations to be occupied on the Nyasa at the navigable end of the Kagera at the portage. Now, in regard to that portage, I found in 1876 that the altitude of this lake by boiling-point was 3471 feet uncorrected by Kew, because the corrections by Kew alter every observation. When I came to Lake Windermere of Speke, I found by aneroid and boiling-point it was 3760 feet, a difference of 289 feet between the middle of the Kagera and the Victoria; that would be perhaps 140 miles of river for 289 feet fall. On this last expedition of mine in 1889 I crossed at Nzungezi near the course of the Kagera, and found a difference between the waters of the river and the waters of the lake at the south-west corner of the Nyanza of 280 feet; and therefore I came to the conclusion, on account of this great difference in level, that there must be two series of rapids, one between Nzungezi and the Victoria, and another between Lake Windermere and Nzungezi. Now, another proof. If the Kagera was navigable—as I wish it was; not for the sake of the Germans, however—but if it was navigable (and remember this lake is only 30 miles from Rumanika's capital) it is obvious that Mitesa would never have thought of sending his soldiers overland to Rumanika's; he would have sent them by war-canoes right across the lake to the Kagera, and up that river until he got to the Windermere, within 3 miles from the doors of Rumanika's house. Then again, if ever there was a geographical genius in Africa it was Captain Speke, and if anything was to be said about the navigability of the Kagera, Speke, who was the best noser that I know of, would have detected it, ascertained it, because Rumanika gave all the geographical intelligence he had, but never said a thing about the navigability of the Kagera. When I visited Rumanika we had regular meetings, and nothing pleased the old man more than to find a white man so interested in the geographical matters of his country that he could sit for hours and ask him questions about this river and that hill, and that water and that lake, and so on. He would have told me something, but I must confess that, though I ascertained a good deal from Rumanika, I never heard the slightest hint of the navigability of the Kagera. However, I shall be very pleased indeed if the African Lakes Company, who have been so happy in the inoculation of every traveller passing through their regions with their ideas, will lift a boat from the Tanganyika, put it on the Kagera, and navigate it down to the Victoria Nyanza.

Between the 657 miles land journey of the Mombasa route and 2500 miles water journeys, and 435 miles of land journey of the southern route, well, you have only to look at the map to make your decision. The day is gradually coming when we must urge with greater force than ever the necessity of providing our British territory with something that will take the poor traveller and the poor black man his attendant at a much more rapid pace than any donkey, elephant, or mule. Besides, if I am not trespassing, and the chairman will allow me just two seconds more, I wish to enlarge upon one particular point: it is the absolute necessity of retaining these countries. I was pleased with what Mr. Scott Elliot said about Nsoga, Kavirondo, and portions of Toro. There is no necessity at all for limiting the government of Uganda to Uganda proper. When we speak of Uganda we speak of the country of the Waganda, who occupy a certain territory called Uganda proper, the seat of the central power; but in reality all Kavirondo and Usogo as far as the Kagera river is subject to Uganda, and so is Ankole, and it is easy to expand the government so that it will embrace all that country lying between the Albert Nyanza and the Victoria, and the Albert Edward and the Victoria, which will include Unyoro.

Colonel Sir H. E. **Colvile**: I have very little to say beyond what Mr. Scott Elliot said. I don't know anything about the further country, but I know the road as far as Uganda, and I think he is perfectly correct as to what he says of the prospects of colonization in the district between Kibwezi and Usoga. It is a fine country, inhabited by an industrious agricultural people; it ranges from 3000 to 8000 feet, and Europeans can live and breed there. Mr. Scott Elliot alluded to his not going to Elgon, and I think I should say that was entirely our fault, and I have to thank him for not going, as the people of the Kitosh district were in an unsettled condition at the time. Captain Gibb, who was in charge at Kampala, persuaded him not to go. Mr. Scott Elliot spoke of the raids of Kabarega into Toro, and describes the damage he has done, but I wish to say now all that is over, and I don't think he will do it again.

Mr. W. **Carruthers**: I have much pleasure in speaking and being permitted to congratulate the Society on the paper, and am happy to say I have no contentious matter to deal with in speaking of the vegetation, because all agree as to its characteristics. The vegetation of this country was practically unknown until Mr. Scott Elliot visited Ruwenzori. He had special qualifications for going on a botanical tour to Ruwenzori. Somehow Mr. Elliot has taken Africa under his charge from a vegetable point of view. He has in previous years explored north, south, east, and west; he began his work in the south, travelling up towards Natal, and crossing over into Madagascar, where he made very important collections, and added much to our knowledge of the flora of these important regions. Afterwards he made the bold attempt of crossing from the north of Africa to the Gulf of Guinea, but at the time he arrived in Tripoli the condition of the people to the south was such that the authorities would not allow him to pass; indeed, his life was threatened if he ventured beyond the borders of civilization. He diverted his attention from Tripoli to Egypt, whence he brought home a large number of plants of that region, thoroughly explored already; and, as the Fellows of this Society know, not long ago he went out with the delimitation commission to separate the English from the French territories at the sources of the Niger behind Senegambia. So he went out to tropical Africa with a very extensive knowledge of African flora, and has made himself master of the conditions of the flora in these higher mountains; but a great deal of the interest of the investigation he has made is the relation of that mountain to the highlands of Eastern Africa. It is well known that there are some ranges of high mountains extending with interruptions from Abyssinia to the Cape, of which Ruwenzori is an outpost, and these mountainous regions are characterized to a large extent by the flora peculiar to them, and among these plants are species limited to the individual mountains; of course it was a matter of great importance to know what Mr. Scott Elliot would be able to bring from Ruwenzori. We know that Schimper and others before him in Abyssinia collected huge tree lobelias; that Mr. Commissioner Johnston and others in Kilimanjaro, and my friend and colleague Dr. Gregory, in Mount Kenia, collected similar huge lobelias and the tree senecios (groundsel), and other plants peculiar to these mountains, and Mr. Scott Elliot has been able to confirm that Ruwenzori has similar vegetation. On Ruwenzori there are probably three of these large tree lobelias, and a large number of smaller species more readily recognized by us from their resemblance to the little plants in our window-sills and gardens. He found a vegetation corresponding very much to that on the highlands to the east of the Victoria Nyanza. He brought home a large collection of plants, more than 2000 species, and it had been impossible to do more than roughly examine them; but there is evidently a large number of new forms corresponding generically with those found on Ruwenzori and Kenia, and having affinities to the Southern African flora and the Abyssinian flora. My colleague Mr. Rendle has been examining the orchids of this extremely interesting collection, and I have no doubt, when we have fully examined the large collection, we shall have a rich harvest of new things, and greatly extend our knowledge of the African flora.

Dr. J. W. GREGORY: I should like to say Mr. Scott Elliot has made a most interesting and important contribution to the geology of Equatorial Africa by the collection he has made on Ruwenzori. It had been reported that some of the valleys had been excavated by a glăcier, and that there were glacial scratches in this district. Stuhlmann and later observers did not verify these conclusions, but Mr. Scott Elliot brings forward evidence to show that glacial action has taken place in this district, so that the old observations may be correct. Stuhlmann's account of the geology is not very intelligible, but the careful notes and the specimens collected by Mr. Scott Elliot enable us now to understand it. I should only like to congratulate Mr. Scott Elliot on his return, on his brilliant contribution to the geography of Equatorial Africa, and on the lucid account he has given us of his discoveries.

Mr. E. G. RAVENSTEIN said that Mr. Scott Elliot's services to zoology and botany had already been referred to, and he might add that in geographical respects, likewise, he had done excellent service. He had seen more of Ruwenzori than any of his predecessors, and in the course of his journey to Tanganyika had crossed much new ground. He quite agreed with Mr. Stanley that Mombasa was the natural outlet for Buganda, but in these days of commercial enterprise, aided by engineering skill, natural trade-routes could easily be diverted, as in the case before them, to Tanganyika and the Lower Zambezi.

The PRESIDENT: Mr. Conway has gone away, but I am glad that he made a note about that Mubuku valley before he left the room, for it was a straight tip given to a mountain climber, which should lead to the completion of the ascent of Ruwenzori. It only remains for us to pass a unanimous vote of thanks to Mr. Scott Elliot for his most interesting paper, and for the extremely valuable work he has done in this little-known region, to which Mr. Carruthers and Dr. Gregory, and more especially Mr. Stanley, have borne witness.*

APPENDIX.

ALTITUDES.—The boiling-point thermometers lent me by the Society have been examined at Kew, both before I started and after my return. The instrumental errors have been spread over the whole of the observations. The daily range has been allowed for, except in the case of the observations along the Stevenson road.

The altitudes are referred to the level of the Victoria Nyanza, assumed to be 3900 feet above the sea, or (in the case of those along the Stevenson road) to Tanganyika, assumed as 2690 feet.

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* Mr. Scott Elliot has found that several people carried away the impression that he was mixed up with the African Lakes Company or the German Government. He is extremely anxious to deny this explicitly, as he received no assistance pecuniarily from any one, except the Royal Society, and has no connection with any African company or Government.

Mombasa Road.—Taru camp, 1040; Buchuma, 1155; Majichumwi, 570; Marugu effundi, 1330; Maungu, 2230; Mkuyuni, 1810; Ndi, 2420; Mbuyuni, 1730; Tsavo, 1410; Ngomeni, 1720; Kibwezi, 2870; Nzowi, 3550; Kiboko, 2770; Mto Andei, 2300; Ngurugani, 3210; Kilungu, 3920; Dekwasomi, 4590; Machako's, 5420; Languru, 5680; Maboko, 4780; Kikuyu, fringe of forest, 5420; Fort Smith, 6260; second swamp beyond the fort, 6900; Kidong, first camp, 5520; Kidong, second camp, 6750; Naivasha, 6740; Gilgit, 6290; Karia Ndoususs, 6250; Camp Mbaruki's, 6200; Nakuru, 6740; Majimoto, Guaso Masai, 6080; Camp, beg. of Mau, 6820; Raomi, 6960; Jackson's camp, Mau, 8160; Camp Aboit, 7790; Mto Mweupe, 5970; Kilelelwa, 4770; Mumia's, 4440; Purkiss's station on Berkeley bay, Victoria Nyanza, 3900 (assumed); Wakoli's, 3950; Kampala, 4122.

Ruwenzori.—Nyamwamba camp, 6990; Nyamwamba, bamboos, 9600; Nyamwamba, base of central core ("Premolar"), 11,140; Mubuku camp, 5100; Wimi camp, 6130; Wimi ridge, 7830; Yeria camp, 6820; Yeria summit, 10,650; Kivata camp, 6610; lower edge of forest at Kivata, 7460; Bamboos, ditto, 8690; Summit, ditto, 10,060; Kasagama's, 5300; Kaleba camp, west side of Butagu, 5530; Butagu camd in heather, 9440; Butagu hills, 12,637.

Lake Albert Edward to Tanganyika.—Kanye, Butumbi, 5160; Latoma on Kagera, 4160; Kitoboko on Kagera, 3990; Karainji lake, 4300; Kangenyi lake, 4450; Kakaruka, 4360; Ru Vuvu, 3 miles above junction with Kagera, 4390; Bugufu level, 5270; Upper Ru Vuvu, 5050; Urundi plateau, 5990; camp near Kiriba pass, 7090; Kiriba pass, summit, 7900; Maboko's, 5660; Kungwe, level of Tanganyika, 2720.

Stevenson Road.—Cherasia, 5030; Mambwe Mission, 5570; Pikombo, 5216; Movo, 5013; Mwenso (Fife), 5040; Tuliguu, 4680; Nimbo, 4470; Chitepa, 4070; Chambo, 3460; Kamissi, 3260; village on Nyasa alluvium, 3 miles from Karonga, 1715.

NOTES ON THE MAPS BY MR. E. G. RAVENSTEIN.

The maps accompanying this paper are rather intended to exhibit the results of Mr. Scott Elliot's labours, as fully as their small scale admits of, than to embody the whole of the information at present available. Mr. Elliot's itinerary sketches are drawn on scales varying between 1 and 2 miles to the inch. They contain numerous bearings upon distant peaks and other objects, and had it been possible to identify a considerable number of these, the map would have greatly gained in value. No observations for latitude were made, but the positions determined by Captain Speke, Mr. H. M. Stanley, and Dr. Stuhlmann proved of service in plotting the work.

The route from Mengo to Kitangule on the Kagera is thus dependent upon several points determined by Speke, whilst on proceeding thence, in a north-westerly direction, to the ferry over the Kafuru lake, Mr. Elliot reached Mr. Stanley's route at Mavona, deviated but little from it in his further march as far as Bwera in Buzimba, and ultimately followed Captain Lugard's route as far as Kiarutanga (Fort Grant).

Of Ruwenzori itself Mr. Elliot has probably seen more than all the travellers who preceded him, and if the map now published is still very sketchy, and in many respects inaccurate, this is owing to the difficulty of obtaining, in the course of a few weeks, a correct delineation of so complicated and inaccessible a mountain region. We shall never obtain a good map of this most interesting feature of Central African scenery until a regular survey of it shall be undertaken. In compiling the map, I have accepted Mr. Stanley's positions for Katwe (Fort George) in the south, and of Kavalli in the north. Dr. Stuhlmann's preliminary map only, and the data given in his book of travel, could be utilized. All observed latitudes accepted by me have been inserted upon the map. Mr. Scott Elliot's residence of the chief Tenge Tenge I have assumed as being identical with Dr. Stuhlmann's Bumbalu, 0° 22′ N. Mr. Stanley's Mtsoro should be looked for on the hot stream of Mbugu, whilst his Muhamba is probably a district on the Ituru river. Fort Gerry, to judge from a rough map by Captain J. R. L. Macdonald recently published by the Intelligence Division of the War Office, occupies the site of Kasagama's town, that chief having taken up new quarters further west, in the heart of the mountains. The numerous bearings of " snowy mountains " given by Mr. Stanley, Captain Lugard, Dr. Stuhlmann, and Mr. Scott Elliot, seem to prove that they are widely scattered. Thus Mr. Scott Elliot's " Premolar " is undoubtedly the " Snow mountain," which Captain Lugard saw from Katwe, bearing 17° magnetic, and not one of the peaks seen from the Upper Butagu. Probably the same peak was sighted by Dr. Stuhlmann from Karo in Mpororo, and from Kirima on Lake Albert Edward.

Mr. Scott Elliot's route from Katwe on the Albert Edward to the northern extremity of Tanganyika led for a considerable extent through territories not hitherto explored. On his way to Latoma, on the Upper Kagera, he crossed Dr. Stuhlmann's route, and his Minaira seems to be identical with the German explorer's Nyeruesika. Thence to the vicinity of the Urigi lake, it was possible to adjust his route to latitudes determined by Speke and Stanley. Between Urigi and Lake Tanganyika Mr. Scott Elliot crossed the routes of Stanley, Count Götzen, and Dr. Baumann, without mentioning a single place to be found on the maps of his predecessors. This portion of the route has, therefore, been laid down quite independently, from his itinerary sketches.

THE GILBERT ISLANDS.

By C. M. WOODFORD.

These are a group of small coral islands in the Western Pacific. They have lately been placed under the protectorate of Great Britain, and having been mentioned as one of the possible places of call for the projected trans-Pacific cable, an account of their history, general appearance, flora, and fauna may not be altogether out of place at the present time. They are also known as the Kingsmills, and in the Pacific are frequently referred to as the Line Islands from their position near the equator. The group consists of a chain of 16 islands, extending in a north-westerly and south-easterly direction from about 3° N. 173° E. to 3° S. 177° E. Their position with reference to other important groups of the Pacific may be said to be, from the Solomons about 1000 miles N.E., from Fiji about the same distance N.N.W., from Samoa about the same in a north-westerly direction, and from the Marshalls about 100 miles S.W. Mr. Wallace* supposes them to be situated upon an extensive bank with less than 1000 fathoms upon it, reaching in a north-westerly and south-easterly direction from the Marshalls to Samoa. The results of the very few deep-sea soundings that have been made in this part of the Pacific are not inconsistent with this idea.

An opportunity occurred to me of visiting the Gilbert group when living in Fiji in 1884, the voyage there and back occupying three months and a half, and being effected in a small ketch of under 40 tons burden, with a total, including myself, of fifty-three persons on board during the voyage down. Of those islands that I visited, I found an outcrop of the compact coral rock above the sea-level on all of them in places, and on the island of Aranuka there appeared to be an elevation of perhaps 20 feet towards the north end; but as I only saw this island from the sea, I cannot speak with certainty. But the main composition of the elevated portion of all the islands appears to be coral débris and sand thrown up by the action of the sea upon the submerged reef.

A reference to the accompanying chart of the group will show that of the 16 islands 11 are of atoll formation, and it will be noticed that in the islands possessing lagoons the elevated part is towards the eastern side, the reef to the leeward or western side being more or less submerged. This I attribute to the fact that the prevailing winds and currents are for eight or nine months of the year from the eastward, so that the broken coral and débris is heaped up upon the eastward or windward sides of the reefs. The one exception to this rule is the lagoon of Taritari, where the elevated portion is upon the south and west, and the submerged reef upon the north. This island, however, is so far to the north, being in 3° of north latitude, as to be within the influence of the westerly winds and currents that prevail north of the line.

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* See 'Island Life,' map of North Pacific with its submerged banks.

The general form of that portion of the reefs that is above water is a long narrow strip of land elevated about 12 feet above the sea, extending the whole length of the windward side of the reef, but the width of this elevated strip does not exceed from 200 yards to half a mile. Sometimes, as at Taputuea, it is broken up into numerous small islands, between which the sea passes over the submerged reef into the lagoon. The depth of the lagoons varies from 3 or 4 to 20 fathoms, but they are studded with coral patches rising nearly to the surface, rendering a good look-out essential when navigating within them. The floor of the lagoons consists either of growing coral or coral sand; but at Apamama the floor of the lagoon was covered in places with a soft pale grey mud, containing the remains of echinoderms, and reminding me irresistibly of the composition of chalk.* At those islands possessing no lagoon, anchorage is only to be found upon the lee side, and generally so close to the shore as to be very unsafe except for small or very handy vessels.

The islands are clothed from end to end with a dense growth of coconut palms and other vegetation, and present a beautiful appearance when approaching them from the sea. The reefs and lagoons teem with fish, thus enabling the islands to support a population which for their land area was at one time equalled in no part of the world.

As an example of the coral atoll, the island of Maraki in this group is perhaps the most perfect known. Dr. Dana compares it, when seen from the masthead, to a garland thrown upon the water. So little do these islands rise above the level of the sea, that if they were situated at a greater distance from the equator, they would inevitably be swept from time to time by the hurricane waves accompanying the cyclonic storms that during certain months of the year prevail in the South Pacific. The island of Nukunau was, indeed, swept over by a wave in two or three places some years ago, during which many of the natives perished. This wave was, however, probably due to an earthquake. I suspect that it is not till the cyclone in its course reaches a latitude of about 12° to 18° from the equator, that the level of the water accompanying it attains a height sufficient to do serious damage. Were it not so, the Ellice group, of similar formation, which lies much further to the southward, would be rendered uninhabitable. During the great hurricane in Fiji, in 1886, the height of the wave, as estimated in various parts of the group, was from 12 to 20 feet, and at Sawayeke washed inland for a distance of half a mile. The native cutter at the village of Vadravadra was carried a long distance inland, and dashed to pieces against a tree.

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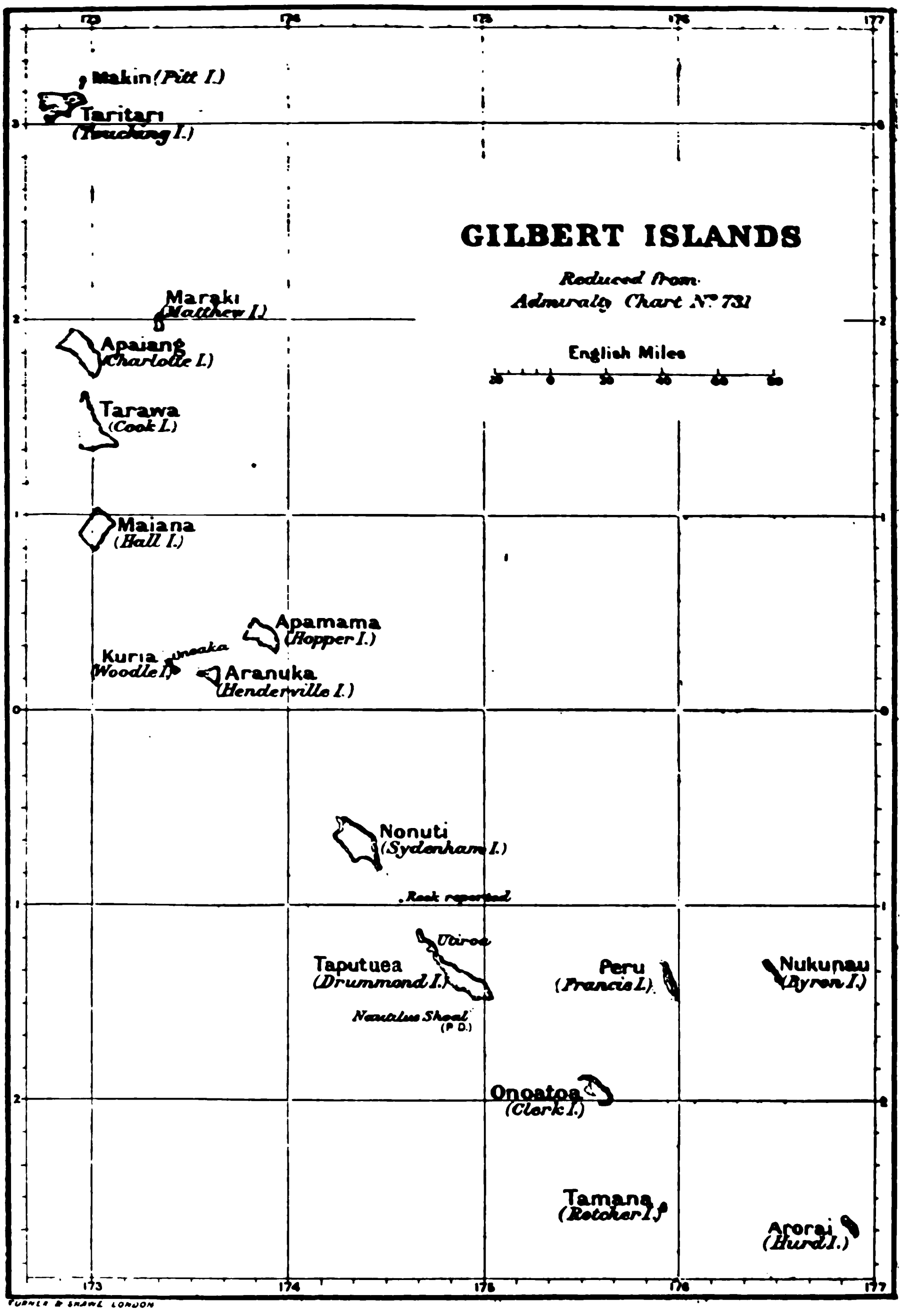
* Specimens of this mud and coral sand were deposited by me at the time in the Natural History Museum.



TURNER & SHAWL LONDON

A wave of the height of 18 feet would be sufficient to sweep away the whole of the population of the Gilbert and Ellice groups.

A visitor, having landed upon one of these islands from a vessel at anchor in the lagoon, walks under the shade of the coconut trees across the narrow elevated strip of land to the seaward side, where the waves of the open sea are beating upon the shore. It is to me a most fascinating thing to watch the long blue ocean swells as they roll in one after another, curling up in one long breaker the whole length of the island; the tops, as they heave upwards, being at first flecked here and there with patches of white foam, which blows away in a salt mist. For an instant the long blue swell of transparent water rushes on, apparently towering above your head, and then curls over and breaks in masses of churning foam, grinding and tearing the coral fragments in its fury. Such is the depth of water right up to the reef, that there is nothing to diminish the force of the ocean swell, that may possibly have originated 1000 miles away, until it breaks actually at your feet. Here and there among the foam may be noticed a coral block, cast up upon the surface of the reef from the depths below, or from the face of the reef during storms. At first sight they appear like the remains of a stratum of reef that once existed at a higher level, but Dr. Dana has shown * that the direction of the cells of the coral of which they are composed proves that they do not stand as they grew; on the contrary, they had been upthrown. Some of them he has estimated to contain at least 1000 cubic feet of solid coral.

The same writer also supposes that the seaward faces of the reefs below water may be not only perpendicular, but may actually in some instances overhang, and mentions two instances, one at the island of Clermont Tonnere, where, at a distance of three quarters of a mile off the island, the lead brought up for an instant at 350 fathoms, and then dropped off again, and descended to 600 fathoms without reaching bottom. Off the south-east side of Ahii (another of the Paumotus), about a cable's length from the shore, the lead, after descending 150 fathoms, struck a ledge of rock, and then fell off, and finally brought up at 300 fathoms. I have myself seen, off the north coast of the island of New Georgia in the Solomons, a line of elevated coral cliffs, about 200 feet in height, that did actually overhang. Unfortunately, I had no opportunity of a closer investigation than the view afforded from a passing vessel; but there could be no doubt of the fact. It might, however, be caused by the action of the surface-waves.

The beach beyond the reach of the waves will be found to be composed of fragments of broken coral, among which innumerable small hermit crabs of the genus Cænobita are hunting for food—everything eatable, and apparently uneatable, not coming amiss to them, from a dead fish to a piece of rotting vegetation or driftwood. The coconut

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* 'Corals and Coral Islands.'

trees grow right down to the beach, and at times are so close to it that the salt spray of the waves actually washes their roots; while their tops, struggling outwards towards the light and air, overhang the water, and drop their ripe nuts into the foam.

Leaving the beach, and passing once more beneath the shade of the coconut trees, the ground will be found to consist of small fragments of broken coral and coral sand, with but little trace of vegetable mould; so little, indeed, as to cause wonder that the palms and dense undergrowth, composed chiefly of *Scævola Kœnigii*, can find sustenance. In the more open spaces will be noticed growing that singular tree, the ***Pandanus***, or screw pine, only second in importance from a native point of view to the coconut itself. From its fruit the natives make a nourishing and not unpalatable food, while from its leaves they plait the beautiful mats for which these islands are noted, and until recent years constituted their only clothing. Their houses are thatched with it, and the masts and sails of their wonderful canoes are made of the stem and leaves of the same tree. Perhaps in the centre of the island will be noticed a long trench excavated in the coral sand about 8 to 12 feet deep, and 10 to 20 feet in width. At the bottom are growing carefully tended plants of a gigantic arum (*Caladium cordifolium*). The arrow-headed-shaped leaves are from 3 to 4 feet in length, and from 1 to 2 feet broad, rising from a solid woody root about the thickness of a man's thigh. The plants are said to take four years to come to maturity, and are highly prized as an article of food. Walking onward, we come out upon the shore of the lagoon. The beach is composed of fine coral sand, of such a dazzling whiteness as to be painful to the eyes, and slopes gradually to the sea, and upon it the smooth waters of the lagoon break in tiny wavelets—a contrast to the boisterous thunder of the surf that we have just left, and whose roar may still reach the attentive ear. Looking out across the pale blue waters of the lagoon, a long white line of foam will from time to time appear upon the horizon, marking where the surf is beating upon the submerged reef to leeward, with perhaps here and there a tiny island clothed with coconut palms and other vegetation, when in the struggle for supremacy between sea and land the latter had gained perhaps but a temporary victory.

Such are the Gilbert Islands at the present time, and such they were at the time of our earliest knowledge of them. Such, too, they doubtless were at the time when their first inhabitants, drifting, no doubt, from their former habitation, by accident, going they knew not whither, and seeking a land they knew not what, happened upon them in their canoes.

In spite of the rapid growth of coral under favourable conditions, the evidence at our disposal tends, in my opinion, to the conclusion that the relative levels of land and sea in the Pacific have changed but little during the past 300 years. It remains with us of the present generation, by the establishment and maintenance of datum marks, to afford to our descendants an opportunity of estimating in the future the changes that may now be taking place. From their very isolated position, and the depth of the sea surrounding them, the Gilbert Islands offer a favourable site for an experiment to ascertain the actual thickness or depth of the coral structure, by means of a bore sunk in the centre of one of the islands. Such an experiment, although expensive, could not fail to be of high scientific interest and value.

In July, 1764, an expedition, consisting of two ships, the *Dolphin* and the *Tamar*, set sail from Plymouth, under the command of Admiral Byron, for the purpose of making discoveries in the Southern Ocean. The departure of this expedition marks an epoch in the history of naval construction, for the *Dolphin* was for this voyage sheathed with copper, this being the first experiment of the kind that had ever been made on any vessel. In April, 1765, the ships left the Straits of Magellan and entered the Pacific, and after calling at the island of Mas a Fuera, continued their voyage westward, afterwards altering the course to N.W., with the object of searching for the Solomon Islands. After discovering several small islands in their course across the Pacific, on June 21, in 10° 15′ S., 169° 28′ W.,* they again saw land, and supposed they had arrived at the Solomons. On discovering their mistake they continued their voyage, having named their discovery Danger Island. On June 24 they discovered another island, in 8° 33′ S., 178° 16′ W.,† and bestowed upon it the name of Duke of York Island. Having now given up all hope of meeting with the Solomon Islands, although the ships were at the time still 1500 miles to the eastward of them (but so few particulars were at that time known of their discovery and position that Byron supposed that they had been originally discovered by Quiros, who, on the contrary, searched for them in vain), on June 29 they hauled to the northward, having sailed 10 degrees to the westward of their supposed position.

On Tuesday, July 2, 1765, an island was discovered in 1° 18′ S., 173° 46′ E.‡ This was the island of Nukunau, in the Gilbert group. They named it Byron Island, and had communication with the natives, who came off to them in 60 canoes. Being unable to find an anchorage in consequence of the great depth of water, the ships left and steered north, crossed the line in 178° E., and on July 31 anchored at the island of Tinian, in the Ladrones.

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* The position of Danger Island as given in Raper is 10° 55′ S., 165° 50′ W. The above position is that assigned to the island by Admiral Byron.

† Position in Raper 8° 36′ S., 172° 21′ W.

‡ In the account of Byron's voyage in my possession, contained in a collection of voyages by Portlock, the longitude is given as 173° 46′ E.; but this must, I think, be a misprint for 178° 46′ E., especially as in the next paragraph it states that, steering north from this island, they crossed the line in 178′ E. The position of Nukunau, according to the latest charts, is 1° 18′ S., 176° 28′ E.

Twenty-three years now elapsed before the Gilbert group was again visited by Europeans. In the year 1787 Governor Phillip left England with a fleet of eleven ships to found a penal settlement at Botany Bay. After landing the convicts the fleet dispersed, and two of them—the *Charlotte*, commanded by Captain Gilbert, and the *Scarborough*, Captain Marshall—sailed from Port Jackson, May 6, 1788, for Canton, having been chartered by the East India Company to bring home a cargo of tea. The two captains arranged to sail in company.

After calling at Lord Howe's Island on May 17, and at Norfolk Island on May 23, they discovered on May 27 an unknown rocky island, to which Captain Gilbert gave the name of Matthews's Rock, after the owner of the *Charlotte*, the position assigned being 22° 31′ S., 172° 16′ E. Continuing their voyage in company, on June 5, at half-past noon, they passed over an extensive bank of soundings, the smallest depth being 14 fathoms. This was named Charlotte Bank, and was said to be in 11° 51′ S., 175° 22′ E. Steering northward, at 1 a.m. on June 18, Captain Gilbert thought that he smelt the land, and at 6 a.m. they sighted three low islands. To these islands Captain Marshall gave the names of Hopper's Island, Henderville's Island, and Woodle's Island, and they are identified in the present chart in the order named, with Apamama, Aranuka, and Kuria.* They had communication with the natives who came off to them in sailing-canoes.

During the night of Thursday, June 19, the two ships steered north, and must have passed the island of Maiana without seeing it. At daylight on the 20th three islands were in sight to the eastward. These must, I think, be identified with the islands constituting the Tarawa group—the Cook Island of the present chart. The names given them by Captains Gilbert and Marshall were Gilbert's Island, Marshall's Island, and Knox's Island. At eight o'clock another large island was seen, and by noon they were abreast of it. It was found to contain a large bay or lagoon, with several small islands like flower-pots on the encircling reef. Captain Gilbert gives the noon position 1° 42′ N., 175° 1′ E.; and Captain Marshall, 1° 50′ N., 173° 0′ E. This was the island of Apaiang—the Charlotte Island of the present chart. To the lagoon Captain Gilbert gave the name of Charlotte Bay, to the principal island the name of Matthews's Island, and to some small islands at the north end of the reef the name of Marlar's Islands. The name of Matthews's Island as applied to the island of Maraki in the present chart, is evidently a mistake, as from the course steered by the ships they could not have seen the island of Maraki at all; but the very clear illustration on Plate I. of Captain Gilbert's book leaves no doubt that his Matthews's Island was the principal island of Apaiang.

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* After a careful comparison of the accounts of Captains Marshall and Gilbert, I am inclined to think that the latter, in the *Charlotte*, never sighted Apamama at all, but that the three islands referred to by him were the two that constitute Aranuka and the island of Kuria. However, from Captain Marshall's account, I think that the island named by him Hopper's Island was certainly Apamama. It must always be borne in mind that these low coral islands, although clothed with coconut palms, are not visible from the deck of a vessel more than 9 miles. From aloft they would probably be visible, from ships of the size of the *Charlotte* and *Scarborough*, about 20 miles.

Captain Gilbert makes the position of the middle island 0·02°., N., 175·54° E. Captain Marshall makes Hopper's Island 0·03° S. (evidently a mistake for N.), 173·43° E.

At seven in the morning of the 22nd land was again seen. It proved to be a collection of six low islands, to which they gave the name of Allen's Island, Gillespy's Island, Touching's Island, Clarke's Island, Smith's Island, and Scarborough Island. The position as given by Captain Marshall is 2° 58′ N., 173° 0′ E., a position they still occupy on the chart, and there is no difficulty in identifying them with the group of islands known as Taritari, the name of Touching's Island being still retained. From this point the ships *Scarborough* and *Charlotte* proceeded on their voyage, and after making several new discoveries among the Marshall group, arrived safely at Canton.

It will be observed that, although the two ships sailed in company, their recorded longitudes differ by nearly two degrees. Neither are correct, but those of Captain Marshall are more nearly so than those of his companion. On the other hand, the map of the islands discovered, given in the Appendix to Governor Phillip's voyage to Botany Bay, can hardly be considered as a serious contribution to the geography of the period, while Captain Gilbert's 'Voyage to Canton' contains no maps, but some excellent eye-sketches of the islands.

Eleven years passed before the group was again visited by a British ship. This was the brig *Nautilus*, commanded by Captain Charles Bishop. A notice of this vessel is found in Ellis's 'Polynesian Researches,' vol. ii. p. 23, where it is detailed that twelve months after the missionaries had been landed at Tahiti by the *Duff*, the *Nautilus* arrived there on March 6, 1798. She was from Macao, and was originally bound to the north-west coast of America for furs. Being driven by a severe gale to Kamchatka, and unable to pursue her intended voyage, she altered her course for the island of Mas a Fuera, but had been compelled by stress of weather to steer for Tahiti. After remaining at Tahiti five days to recruit, she left, but was back again in a fortnight, having encountered bad weather off Huahine. Giving up the idea of the voyage to Mas a Fuera, she steered for Port Jackson, taking with her, at their own request, the majority of the ill-assorted items that had been landed from the *Duff* a year before. I find from a passage in 'Travels and Researches of Eminent English Missionaries,' by Andrew Picken, London, 1831, that the passage of the *Nautilus* from Tahiti to Port Jackson occupied six weeks, but from the same book it appears that she visited Tahiti again in 1800 or 1801. In the interval she appears to have cruised in the Pacific, and on July 1, 1799, sighted the south end of the island of Taputuea. At dark the same evening she arrived off the dangerous reef that extends to the westward of the south end of this island. Going about, she stood to the south-west, but during the night again sailed northwards, and on the 2nd anchored near the north end of the island, probably at the anchorage of Utiroa, where the ships of the United States Exploring Expedition anchored in 1841. To the reef at the south end of the island the name was given of the Nautilus Shoal, to the principal island the name of Drummond's Island, and to the whole of the Taputuea group the name of Bishop's Islands.

On the following day at noon the ship was close to the south end of the island of Nonuti, to which the name of Sidenham Teast's Island was applied, and on the 4th they passed close to its northern end. At daylight on the 5th they sighted Apamama, and named the Apamama group Roger Simpson's Islands. To the most southern island of Apamama they gave the name of Harbottle Island, and at noon were close to the small island on the western extremity of the Apamama reef. They sighted but did not name the island of Aranuka. Sailing northward from Apamama, they continued their voyage without sighting any other island of the Gilbert group.* I fancy that the name of Kingsmill Islands, as applied to the Gilbert group, also originated with the voyage of the *Nautilus*, as, although the name was not mentioned by Gilbert or Marshall, I find it used in a large map of the world on Mercator's projection, by Heather, dated 1803. The Roger Simpson's Islands of the *Nautilus* do not seem to have been recognized at the time as one of the discoveries of Captains Gilbert and Marshall.

The next voyage to add to our knowledge of this group was that of the *Elizabeth*. The account of the islands seen during the voyage will be found among the notes to Purdy's 'Table of Positions,' published in London, in 1816. No communication appears to have taken place with the natives; but the description of the islands, as seen from the sea, especially the description of Tarawa, is excellent, and the longitudes are so carefully calculated and so exact as to leave no doubt as to the identity of the islands seen. I give the extract from Purdy *in extenso.*

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* Although no account of the voyage of the *Nautilus* appears to have been published, a chart of the islands discovered was published by Dalrymple, the hydrographer to the Admiralty, in 1802. I searched the Library of the Royal Geographical Society and the British Museum in vain for a copy of this chart, nor was it to be found at the Admiralty, but by the kindness of Mr. Silver and Mr. Petherick, my attention was directed to the India Office, where I at last found a copy.

The *Nautilus* seems to have afterwards cruised for some years in the Pacific, and in or about the year 1801 is asserted to have discovered an island in lat. 8° 36′ S., long 167° 50′ E., to which the name of Kennedy Island was applied. It is safe to say that this island does not exist in the position assigned to it by the *Nautilus*, as it was unsuccessfully searched for by a German man-of-war in 1884, but it still appears on the present chart, with the note "Existence doubtful."

It has been supposed by some to be the island of Jesus of Mendana, 1567, but to this view I am opposed (see *Proceedings* R.G.S., June, 1888). The chief thing in favour of the island's existence at all is, in my opinion, the fact of its possessing a native name, "Motuiti," a word of purely Polynesian origin. I hope to have an opportunity next year of searching for this island, and clearing up, if possible, the doubts as to its existence; but I think that it will be found that the position assigned to it by the *Nautilus* will prove to be in error by about five degrees of longitude, and that it is one of the small islands composing the Sikaiana or Stewart Island group in lat. 8° 24′ S., long. 163° 1′ E.

"The following description of islands, which we suppose to have been discovered in 1809, appeared in the periodic publications for 1810; and we presume that no apology will be required for our giving it in this place. It will be seen that the description commences from the southward. Taswell's Isle, the first mentioned, appears to be the St. Augustine of Maurelle, 1781, and Sherson Isle the Gran Cocal of the same.* For Hope Island the editor has on the charts substituted Hurd's Island, from respect to Captain Hurd of the Navy, Hydrographer to the Admiralty; there being another Hope Island at about 14° distant, to the northward of the equator.

" Situation of islands seen in the Pacific Ocean by the brig *Elizabeth* from Port Jackson to China.

"Taswell's Isle. West side, 5° 37′ S.; long. by sun, moon, and chronometer, 176° 9′ 34″ E.

" Sherson's Isle. About S.S.E. of the above, 4 or 5 leagues, more extensive. These islands appear well wooded, very low, and cannot be seen above 6 or 7 leagues in the clearest weather from the masthead. They lie in a N.W. and S.E. direction.

"Hope (Hurd's) Island. S.E. side, in lat. 2° 43′ S.; † long. by sun and moon, 176° 56′ 25″, and by chronometer, 177° 0′ 25″ E.

"Blaney's Isle. Lat. 0° 32′ S.; long. by sun and moon, 174° 20′ E., by chronometer, 174° 35′ 12″ E.; extending about N.W. by W. and S.E. by E., long and low, and, like the foregoing, with abundance of coconut trees. ‡

"Dundas Island. Seen the same evening, lat. 0° 9′ N.; long. by sun and moon, 173° 54′ 30″, and by chronometer, 174° 9′ 30″ E.; sounded at 7 p.m., no ground at 80 fathoms about 4 miles off shore. §

"Hall's Isle. Lat. 1° 0′ N.; long. by sun and moon, 172° 56′ 33″, and by chronometer, 173° 14′ 48″ E. This island is long and low, and abundantly supplied with coconut trees, which were plainly perceived from the deck.‖

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* As Gran Cocal has since been found not to exist as an island, but only as a shoal, the Sherson Island seen by the *Elizabeth* was probably Hudson Island—Nanomea of the present chart.

† Hurd's Island is Arorai.

‡ Blaney's Island is Nonuti.

§ This island I must identify with Apamama. The longitude almost exactly agrees, but the latitude is about 8 or 9 miles out. This I account for by the fact of the island having been sighted in the evening, the latitude being, no doubt, estimated from the noon observation. If it had been Aranuka, the *Elizabeth* would have, steering the course she was evidently doing, sighted Kuria as well. But I think it is evident that the ship passed about 4 miles to the eastward of Apamama.

‖ Hall's Island was evidently Maiana.

“The same day, and before this island was sunk from the deck, saw another right ahead; steering N.W. by N., stood-to within 4 miles of it; hove-to and sounded, no ground at 80 fathoms. At 3 p.m. had sights for chronometer, when the nearest shore, being nearly the centre of this part of the island, bore N. by W. ½ W. about 4 miles, the western extreme being the S.W. point N. 59° W., 8 miles; and the eastern extreme or S.E. point N. 51° E., about 10 miles; from which bearings I place the body of Cook's Isle in lat. 1° 16′ 18″ N., long. by sun and moon 172° 53′ 18″, and chronometer 173° 11′ 33″ E. The S.E. side of the island extends nearly east and west about 6 leagues. Off the S.W. point a sandy beach runs to about a mile, or perhaps more, with a heavy surf on it, although the sea was very smooth. Over it, the land, extending some distance to the northward, with a deep bight, seemed to form a large bay on the west side. Saw an immense number of natives on the beach, and several canoes hauled up. It appeared one continued chain of coconut trees or topes; and as we ran along shore, at about 3 or 4 miles distance, saw over the nearest land, coconut trees also; therefore suppose this island of much larger extent than any we have seen yet.” *

The *Elizabeth* then steered to the N.W., and sighted several islands in the Marshall group, with which at present we are not concerned. Purdy adds a note: “I also suppose that there is a continuation of the islands south of Mulgrave Islands (with intervals of small distances), and Bligh's Isles and the Feegees.”

In the year 1824 the French corvette *La Coquille*, in the course of her voyage round the world, under the command of Admiral Duperrey, passed through the Gilbert group. For some reason or other, the narrative portion of the account of this voyage appears never to have been completed; for the copy that I have consulted in the Royal Geographical Society's Library stops abruptly at page 202, and the copy in the British Museum is in the same condition. From the volume devoted to the hydrography of the voyage, however, I find that the *Coquille* sighted Taputuea on May 15, 1824, and thence sailed northwards, sighting all the islands north of Taputuea, with the exception of Taritari and Makin, and thence continued her voyage through the Marshalls.

In the superb atlas relating to this voyage, a chart is given of the whole group, and plans on a larger scale of nearly all the islands sighted. These are as accurate as can be expected from a rough survey made from the deck of a passing vessel. The Nautilus shoal, at the south end of Taputuea, is shown connected with the reefs, and not as a detached danger. This representation of it is, I believe, more likely to be correct than the position given by Commodore Wilkes (1841), and still appearing in the British charts (1894). I myself, in 1884, sailed close to the position the shoal occupies in the British chart, without seeing it. A reference to Dalrymple's chart of 1799 will show that the shoal, or reef, bears about W. 10° N. from the southern extremity of the island, while in the present chart it appears as a doubtful position, bearing about S.W. from the same. The wreck of the *Corsair*, referred to below—if, as asserted, it occurred on the Nautilus Shoal—would tend to show that the shoal is only an extension of the reef to the westward.

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* This is an excellent description of the south side of the island of Tarawa. I suppose the name of Cook Island was bestowed by the *Elizabeth* after Captain Cook the navigator. The island had already been discovered by Captains Gilbert and Marshall, who saw it from a different point of view. To them it appeared as three islands (see *ante*).

At Nonuti, or Sydenham Island, two small islands are shown lying off the north-west end. To one of them Duperrey gave the name of Ile du Nord. These two islands do not exist in the position shown; but taking into consideration that the *Coquille* only arrived off the south end of the island at half-past seven in the evening, and must have been coasting along its western side during the night, the plan of the island is, under the circumstances, remarkably correct. The north end of the island is divided up into several small islands, and it would be easy in the dusk to mistake their relative positions. To a small island near the north end they gave the name of Sable Island. This island Commodore Wilkes's expedition, in 1841, was unable to identify; but I fancy, as its name seems to imply, that it was a sand cay that exists on the most western part of the reef, and, when seen in a bad light from the south end of the island, might appear to lie off the north end.

The fishing-huts shown by Duperrey on the reef near the south end of the island were probably only temporary erections of poles and thatch, and I suspect disappeared during the first westerly gale after his departure; but they are still retained upon the chart, and I must confess that I felt injured when, at my visit in 1884, I failed to see them. I would respectfully suggest to the Hydrographer to the Admiralty that they be expunged.

Duperrey groups the two islands of Nonuti and Taputuea together under the name of "Iles Bishop," after the name of the captain of the *Nautilus*. To the islands of Apamama, Kuria, and Aranuka he gives the collective name of Simpson's Islands, after Roger Simpson of the *Nautilus*. and identifies the Dundas Island of the *Elizabeth* with an island forming part of the Apamama group (see note, *ante*). The islands of Maiana, Tarawa, Apaiang, and Maraki Duperrey groups together under the name of Scarborough Islands, after the name of Captain Marshall's ship; the Knox Island of Captains Gilbert and Marshall becoming, doubtless owing to the exigencies of French pronunciation, Knoy Island. The islands of Taritari and Makin, not visited by the *Coquille*, are presented in Duperrey's chart near the positions assigned to them by Captains Gilbert and Marshall, with the note "position doubtful." In Duperrey's general chart of the group, the island of Peru is shown under the name of Francis

Island, its position being 1° 30′ S., 173° 12′ E. from Paris, and in the appendix to the atlas it is said to have been discovered by the ship *Francis*, in 1827. I have not been able to obtain any information about the voyage of this ship.

About this time the neighbourhood of the Gilbert group became a favourite fishing-ground for ships engaged in the sperm-whale fishery, and on the night of January 13, 1835, the *Corsair* whaler, of Liverpool, was totally wrecked on the Nautilus Shoal at the south end of the island of Taputuea.

I consider that the wreck of this ship demands more than passing notice here on account of the extraordinary adventures of the survivors. After calling at Nukunau on Christmas Day, 1834, the *Corsair* caught several whales among the islands, and on the evening of January 13, 1835, land was reported from the masthead bearing E.N.E. They stood towards it, and at 9 p.m. proceeded to wear ship, but before the ship got before the wind she struck heavily and remained. The tide was falling, and the ship began to bump heavily. Fearing that the masts would go over the side, four boats were lowered with six men in each, with instructions to keep as near the ship as was possible. The fifth boat, with six of the crew, including the captain, remained on board during the night, and cut away the masts. Before daylight the water was up to the lower deck-beams, and all hope of saving the ship was abandoned. The boats were hailed, but only three of them returned; the fourth, containing the doctor and five men, was not seen again, and it was supposed that it had been beaten to pieces on the rocks. At daylight the four remaining boats, with twenty-four men, proceeded to a small sandy island on the reef, distant about 4 miles from the mainland; the idea being to select a spot where they might build a small vessel to take them to some civilized place. The captain's boat proceeded to the mainland, and was never heard of again, the crew being probably massacred by the natives. The following day the natives, in eighty or ninety canoes, attacked the boats on the sandy island. They were driven off with some loss, but Mr. Renny, the mate, was left by them for dead. His comrades carried him to the boats, and the three remaining returned to the ship. After a consultation, it was decided to build wash-streaks upon the boats, and endeavour to reach in them the island of Tinian, in the Ladrones, a voyage of over 2000 miles. Forty gallons of water and 120 lbs. of bread were placed in each boat, and the wreck was then set on fire. Mr. Renny, suffering from three severe wounds in his head, a broken arm, and other injuries, implored to be left to die on the wreck, but was taken into one of the boats. The three boats, containing eighteen men, then left the wreck, and steered a north-west course, under the direction of the second mate, who fortunately had been able to save a quadrant. Until February 3rd the boats continued in company, but on this day Mr.

Renny, who had by this time so far recovered as to be able to direct his own boat, was parted duing the night from his companions. On the 4th they caught several flying-fish, and eagerly ate them raw. During the night the weather was so bad with a heavy sea, that they rigged and rode to a sea-anchor until the morning. The allowance of food was by this time reduced to half a biscuit and half a pint of water a day. By noon on February 10th Mr. Renny considered that he had nearly run his distance; but the weather was so bad that they had again to have recourse to the sea-anchor, and in rounding-to were struck by a sea and nearly swamped. The following day at 3 p.m. they sighted the island of Sapan, one of the Ladrones, and at 11 p.m. landed on the island of Tinian, being the twenty-sixth day after leaving the wreck. The next day they left for the island of Rota, where, on arrival, they found the two other boats. Mr. Renny afterwards proceeded to Guam, and obtained a passage to Sydney, whence he returned to England, where he published an account of his adventures; but curiously enough, at the time, he was not aware of the fate of the other boat, containing the doctor and five men, which disappeared during the night the ship was on the reef. This boat was furnished only with 1½ gallon of water and 1½ lb. of bread, most of which was consumed during the night. In the morning, being exhausted with rowing, they put the boat round and steered N.W., hoping to make Ocean Island. On the fourteenth day after leaving the ship, having in the mean time subsisted upon a few flying-fish, and met with rain near the equator, they altered their course and steered north. The same day they cast lots, but next morning, having seen a small land bird settle upon the steering oar, they put off their intention of killing one another, and on the seventeenth day sighted land, and landed on the following day upon the island of Bonebay (Ascension), one of the Caroline group.

In the year 1841 the *Peacock* and *Flying-Fish*, two of the ships of the United States Exploring Expedition under Commodore Wilkes, visited the Gilbert group, and it is mainly upon their careful survey that the present chart of the islands is founded. The two ships arrived off Taputuea on April 3, and anchored off the village of Utiroa, near the north end. They remained until the 9th, and had friendly intercourse with the natives; but, in consequence of the treacherous murder of a seaman, severe punishment was inflicted, and Utiroa burned. On the 10th they visited and surveyed Nonuti, and afterwards in turn the islands of Aranuka, Apamama, Kuria, and Maiana. On April 16, while the ships were at Kuria, a white man came on board, who announced himself as "John Kirby, a deserter from the English whaleship *Admiral Cockburn*." He had been three years on the island, and asked to be taken away. After surveying the island of Tarawa, they reached Apaiang on the 24th. The *Flying-Fish*, while engaged upon the survey of the lagoon, got aground on the top of high water, and the natives attempted to attack, but were repulsed. The *Peacock* was hove-to during the night, in order to stand by the *Flying-Fish;* but in the morning found herself ashore on the north end of Tarawa, having drifted 12 miles to the southward during the night. Both ships came off without damage, and proceeded to the island of Maraki.

On the 27th the *Peacock* left Maraki to search for the islands of Taritari and Makin. These, it will be remembered, had not been seen by the *Coquille.* The islands were found on the 28th, and another white man, named Robert Wood, a Scotchman, left by the English whaling brig *Janie* seven years before, was taken away. The two ships then proceeded on their voyage. From the two white men much information was gathered of the manners and customs and language of the natives, and in vol. v. ch. iii. of the narrative of the voyage of expedition will be found an admirable account of the islands. The part of the group visited by the expedition was carefully surveyed, but from the natives they obtained the names of five other islands which they did not visit. These were the islands of Peru, Nukunau, Arorai, Tamana, and Onoatoa. Of these five, the first, viz. Peru, discovered by the *Francis* in 1827, Nukunau discovered by Byron in 1765, and Arorai by the *Elizabeth* in 1809, are represented by Commodore Wilkes in his chart in their more or less correct position.

An island named Phœbe Island had been reported in 0° 15′ N., 176° 46′ E., and Wilkes, supposing it to be the Tamana of native report, has connected the name of Tamana with Phœbe Island, and it is marked on his chart in the position named. "However, it is safe to say that no island exists in that locality. Mr. Foster, chief mate of the bark *Jamaica,* states that when trading within the group from 1842 to 1844, he shaped his course more than twenty times from Byron Island for the position assigned to Phœbe Island, without seeing it, and it has never been seen since. There appears to be little doubt that it is a transposition of Baker or Nantucket Island, sometimes also called Phœbe Island, from west into east longitude." *

I am able to add to the above Mr. Foster's own words. At the time he writes of he was an apprentice on board the *Sussex* whaler. He says, "After leaving Tahiti we proceeded westward, and having failed on our previous visit to the Kingsmills to find Phœbe Island, placed on the chart in 1° N., 176° E., being about 100 miles due north of Byron Island, accordingly we kept as near the parallel of latitude as possible, thinking the longitude might be erroneous on the chart, which turned out to be the case, as we fell in with it in 176° W. instead of E., being an error of more than 400 miles, and one that might involve the loss of many a fine ship and crew. It was noted in the log, the captain intending to report it on our arrival in England, but in consequence of his death the report was omitted. We landed on this island, which was just like the Kingsmills, but not inhabited, and found the grave of a sailor who had died on board an American whaler. They had written a kind of epitaph, but I forget the particulars. We got our boat stove in landing." *

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* 'Reported Dangers to Navigation.' U. S. Hydrographic Office, 1871.

Two islands of the Gilbert group still remain unaccounted for—these are Onoatoa or Clerk Island, and Tamana or Rotcher Island. The latter island used, I am told, to be also known as Chase's Island by the whalers. I have been unable to trace the history of the discovery of these two islands. Even as late as the time of Commodore Wilkes in 1841, the fact that two islands existed between Taputuea and Arorai was unknown. His map only shows one, which he calls Onoatu or Rotcher, thus giving it the native name of one and the discoverer's (?) name of the other. I have shown above the confusion into which he fell in identifying Tamana with the phantom Phœbe Island.

Even at the present time the exact longitude and even the latitude of some of the islands has not been correctly determined, and it is possible that there are yet other dangers to be reported. The Samoan trading schooner *Caluna* reports having struck a rock with five feet of water upon it, about halfway between Taputuea and Nonuti in 1889. In Duperrey's chart the group appears divided into three portions, under the names of Scarborough, Simpson, and Bishop Islands; by the United States Exploring Expedition the whole group is described under the name of the Kingsmill group; but at the present day they are more generally known as the Gilbert Islands, after Captain Gilbert of the *Charlotte*, a name that I consider entirely appropriate.

I invariably advocate the use of native names where possible, and in this group, at any rate, they are not likely to be superseded, as it is the general practice in the Pacific at the present day to refer to them by their native names.

The names of the islands, with their approximate positions and dates of discovery, are as follows :—

Makin,	3° 7′ N , 172° 57′ E.	Discovered by Captains Gilbert and Marshall in 1788, and named Allen, Gillespy, Touching, Clark, Smith, and Scarborough Islands.
Taritari,	3° 5′ N., 172° 49′ E.	
Maraki,	1° 58′ N., 173° 20′ E.	Erroneously, I think, called Matthew Island on present chart.
Apaiang,	1° 50′ N., 173° 0′ E.	Matthew Island of Gilbert, 1788. Now Charlotte Island.
Tarawa,	1° 25′ N., 173° 0′ E.	Gilbert, Marshall, and Knox Islands, 1788. Cook Island of the *Elizabeth*.
Maiana,	0° 55′ N., 173° 0′ E.	Hall's Island of the *Elizabeth*, 1809.

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* Mr. Foster is now, and since 1856, a Trinity pilot at Dover. He is now senior pilot, and in 1887, the Jubilee year, was appointed pilot to H.M. yacht *Victoria and Albert*.

Apamama,	0° 22′ N., 173° 51′ E.	Hopper Island, 1788. Roger Simpson's Island of the *Nautilus*, 1799, and to a small island at the south and Harbottle Island. Dundas Island of the *Elizabeth*, 1809.
Kuria, with Oneaka,	0° 14′ N., 173° 25′ E.	Woodle Island, 1788.
Aranuka,	0° 11′ N., 173° 36′ E.	Henderville, 1788.
Nonuti,	0° 40′ S., 174° 21′ E.	Sidenham Teast's Island of *Nautilus*, 1799. Blaney Island of the *Elizabeth*, 1809. Now Sydenham Island.
Taputuea,	1° 20′ S., 174° 50′ E.	Drummond Island and Bishop's Island of *Nautilus*, 1799.
Peru,	1° 23′ S., 175° 55′ E.	Ship *Francis*, 1827.
Nukunau,	1° 20′ S., 176° 29′ E.	Byron Island, 1765.
Onoatoa,*	1° 55′ S., 175° 35′ E.	Clerk Island. Date and discoverer uncertain; but probably by whalers previous to 1840.
Tamana,	2° 33′ S., 175° 55′ E.	Rotcher Island and Chase's Island of whalers not known to U. S. Exploring Expedition.
Arorai,	2° 40′ S., 176° 53′ E.	Hurd Island of the *Elizabeth*, 1809.

In the year 1857 the Rev. Hiram Bingham, an American missionary, was landed by the Hawaiian Board of Missions on the island of Apaiang. He lived there seven years, translating portions of the Bible and other books into the native language, and was able to announce in 1890 that the translation of the entire Bible was complete. Hawaiian native teachers were from time to time landed upon other islands of the group as opportunity offered, and at the present time the whole of the group, from Taputuea northward, is nominally under the influence of the Society.

In 1871 the Rev. J. S. Whitmee (a Fellow of the Royal Geographical Society), of the London Missionary Society, having been appointed to visit the Tokelau and Ellice groups, was instructed afterwards to proceed northward. By a fortunate circumstance, he was able to take back to their homes three natives of the Gilbert group who were anxious to return. This served as a means of introduction to the natives, and Samoan teachers were landed upon Arorai, Tamana, Onoatoa, and Peru, and subsequently upon Nukunau. At the present time there are twelve trained teachers distributed among the five islands, and it may, I think, safely be said that the population of these five southern islands is now Christian. In 1892 a British Protectorate was proclaimed.

From my own observation, I should say that the natives of the islands under the influence of the London Missionary Society are more liable to err from an excessive insistence upon matters of small importance rather than from a lack of religious zeal, and it seemed to me that there was a demand for more frequent supervision by a white missionary to mould the ideas of the natives in the right direction. Perhaps, now that the

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* This island is reported to lie five miles north of the position it occupies on the present chart.

Society have a steamer in place of a sailing-ship, white missionaries will be able to visit the islands at shorter intervals.

From their isolated position, and consequent removal from external influences, the islands are peculiarly fitted for the support of a large native population. The Peruvian slavers will never again trouble them. I trust that the labour trade, so far at least as regards these islands, will also be stopped. For years past the Agent-General of Immigration in Fiji has refused to indenture these natives to work upon sugar plantations. They are entirely unsuited for such labour.

For a white population in the islands there is no place, except, perhaps, a trader upon each island. Now that they are under British protection, civil wars will be rigorously suppressed, and I consider that, under the combined direction of the Government and the missions, the islands should have a bright and prosperous future.

I come now to the consideration of the origin of the natives of the Gilbert group.

The officers of the United States Exploring Expedition had peculiar facilities of inquiring into the natives' tradition of their origin, as they had with them the two white men who had lived for years among the natives. According to their account, the first inhabitants arrived in two canoes from an island called Barness or Baneba, said to lie to the south-westward. After they had arrived two other canoes came from the south-eastward, from an island called Amoi. These natives were lighter in colour, and spoke a different language. For two generations the two races lived together in harmony, but eventually disputes arose over the women, and the Amoi men were killed, the Baneba natives taking possession of the women.

Curiously enough, at the time of the United States Exploring Expedition the identity, or even the existence, of the island of Baneba was not certainly known. It is the island of Panopa or Ocean Island * of the chart. In Commodore Wilkes's map Ocean Island is marked, but with a note of interrogation, signifying either that its position or existence was doubtful; nor does he connect Ocean Island with the name of Baneba. Amoi he supposes to be an island in the direction of Samoa, but it must surely be Samoa itself, for I have myself heard the Gilbert Islanders speak of Samoa as Amoa. Ocean Island lies about 300 miles to the westward of Nonuti. The natives of this island and of another, Pleasant Island or Nauru, about 150 miles further to the westward, probably came originally from the Carolines.

Other immigrations possibly took place into the northern islands of the Gilbert group through the Marshalls, and the general appearance of the natives certainly confirms the idea that in the Gilbert group the

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* Discovered in 1804 by a ship called the *Ocean*.

Polynesian and Micronesian races of the Pacific meet and mingle, the latter element predominating.

When we take into consideration the habits of these islanders, it is small wonder to me that the islands, remote as they are, should have received their population by chance comers from distant islands. Even at the present time canoes are frequently driven out to sea and lost. The native custom of fishing outside the reef in the daytime for bonito, and at night for flying-fish, is a habit that they doubtless brought with them from their former place of residence. A sudden squall from an unexpected quarter would be sufficient in a few hours to take them out of sight of land, and the winds and currents would do the rest. Who can speak of the tales of the sea, of suffering and of death, that must have happened before these islands received their first inhabitants?

The Rev. Mr. Whitmee mentions a case of a single native in a canoe having been drifted from Manihiki to the Ellice group about 1861, and similar instances have come under my own notice.

A fact that has irresistibly struck me is the serious diminution that has taken place in the population from what it appears to have been down to fifty years ago. All the earlier discoverers speak of the density of the population. Sixty canoes, with from three to six men in each, came off to meet Byron at Nukunau. Thirty came off to Gilbert from the small island of Kuria, and many others were seen on the beach. Wilkes in 1841 estimated the population of Apamama, Kuria, and Aranuka jointly at 28,000, and the total population of the group at 56,000. I doubt if, at the present time, it reaches a quarter of that number. The Rev. Mr. Turner estimated the population of Peru in 1876 at 2500. My own inquiries in 1884, from a white trader, place it at 1500, Nukunau 1850, Onoatoa 1050, and Tamana 570. At the time of my visit I was told that the population of Kuria and Aranuka was limited to 100 on each island by order of the King of Apamama, and I am perfectly certain that 4000 would have been an extravagant estimate for the population of Apamama itself.

On Taputuea the population was estimated by the United States Exploring Expedition at 10,000. I did not visit the northern end of the island, but at the southern end the adult male population in 1884 had been almost exterminated by fighting.

I find it hard to believe that the islands, mere dots as they are, can ever have carried the population spoken of by the United States Exploring Expedition; but I fear the cause of the decrease must be in part due to the more frequent intercourse in late years of the natives with white men. From them they have obtained firearms, rendering their frequent battles much more fatal. Upon these small islands there is no means of escape for the beaten side except to sea, when the chances of escape are small on account of the currents. Such was the case when the King of Apamama took possession of Kuria and Aranuka. The Peruvian slavers took away large numbers of them, about the year 1863, to work upon the guano islands, none of whom ever returned, and in later years the recruiting of natives to work upon the plantations in Fiji, Samoa, and Tahiti must have contributed largely to the decrease. I noticed a similar state of things at Nukufetau, in the Ellice group, where, in spite of large families being the rule, the population at the time of my visit was only 240.

That my observations of the decrease in population among the smaller groups of the Pacific are not singular, is shown by a statement in the *Chronicle of the London Missionary Society* for October, 1892, where, speaking of the Hervey group, the Rev. G. Harris says that the 16,000 of John Williams's time is now reduced to a little over 6000.

In colour the natives are of a copper hue. The hair is black and glossy, and not wavy as among natives of purely Polynesian race. Many of the women have perfectly straight, raven-black hair, of a good length. They have, when young, good figures, well-rounded limbs, and frequently beautifully shaped hands and feet.

The cheek-bones are prominent, giving a flattened appearance to the face, and suggestive of a resemblance to the Japanese type. Upon Apamama the ruling family differ from the rest by their extraordinary size. At the time of my visit the use of a waist-cloth of calico or cotton print, and in some cases among the men even shirts and trousers had superseded the use, or perhaps I should say the disuse, of native dress. Formerly their clothing, when any was worn, consisted of mats, some of them most beautifully plaited, made from the leaves of the pandanus. I found the women wearing either a long cotton sacque or a decent fringe of pandanus leaves round the waist, and when at work, ashore or afloat, the latter was invariably worn in preference to the former.

Only on Taputuea did I see any of the curious fighting cuirasses that are described in Commodore Wilkes's narrative, and I fancy that with the introduction of firearms they must have gone to a large extent out of use. Probably at the present day more exist in museums than in the islands. Some very fine examples are to be seen in the British Museum. They consist of a complete coat of plaited sinnet, resembling, in fact, a coat of coconut-matting, but much thicker and stiffer. A high collar projects upwards round the back of the neck to protect the head and ears, and there are also coverings for the arms and legs. A helmet is made of the skin of the porcupine fish, and sometimes of a large skate or ray. The offensive weapons were spears and swords made of coconut wood, armed on either side with sharks' teeth, each tooth being drilled with two small holes, and bound to the shaft with finely plaited sinnet. With these they poked and slashed at one another, inflicting fearful wounds. Another kind of spear I saw, intended apparently for thrusting, was pointed with three spines of the sting ray, loosely attached, and evidently meant to remain in the wound. I saw several natives on Taputuea with healed scars of terrible appearance, and one man with a large open gash in his arm extending from the shoulder to the elbow; but such appears to be the healthy condition of these islanders, attributable, I expect, to their simple diet of fish and vegetable food, that wounds that would probably prove fatal to a white man appear to cause them little inconvenience, and rapidly heal. I also noticed their indifference to pain, for one of them at his own request allowed me to attempt to remove a tumour from his arm, and stood the necessary cutting without wincing.

The natives have little need of fresh water for drinking purposes, as they are usually well supplied with coconut toddy and the juice of the young nuts, and this appears in the ordinary way to suffice for their needs. Rain falls frequently, but I do not remember noticing any attempt made to conserve it. A small quantity is to be had by digging in the coral to sea-level, but the water so obtained is brackish. When I was at Taputuea, an attempt was made to get a supply of fresh water for the ship. We were directed to a well that had apparently not been used for some time. When the sand had been cleared out of the bottom of it, the water trickled in in a meagre stream, and was ladled out a coconut shell full at a time. It took a whole day to fill two small casks. Fortunately, we caught a good supply of rain-water a few days later.

Among these islands I saw for the first time the preparation of toddy from the coconut tree. Its manufacture is, I believe, unknown among the Polynesian and Melanesian races of the Pacific, and is an art that the Micronesian element doubtless brought with them from their former home, since it is known in the Marshalls and Carolines, and also among the Malays of the Archipelago. To the Gilbert Islanders it is known as karuru. When freshly drawn from the tree, it is of an agreeable taste, resembling ginger-beer; but if allowed to stand, it ferments and becomes intoxicating. It is sometimes reduced, by successive boilings, to the consistency and sweetness of molasses, in which condition it forms an excellent substitute for sugar. It is then known as kamaimai.

An article of food called kabubu is prepared from the fruit of the pandanus. It is pounded between stones into a substance resembling sawdust. It has a sweetish taste, and is made up into long rolls tightly bound with sinnet and preserved for use. It is eaten moistened with water, and an infusion of it is also used, reminding me of flat beer. A small quantity of inferior taro (*Caladium cordifolium*) is grown, and is highly prized; but of course the principal article of vegetable food is the coconut. The natives' diet, with the above exceptions, consists exclusively of fish. Day and night they are engaged in their capture. Bonito are caught by means of a pearl shell bait with a hook of tortoiseshell, and flying-fish are captured at night, being attracted by the light of a torch of coconut leaves, and scooped up in a landing-net as they fly to the light. The sight of twenty or thirty canoes advancing in line, each one with a flaming torch, casting deep shadows upon the water from the dusky limbs of the natives standing erect in their canoes, is one not readily to be forgotten.

Fish of all kinds positively swarm among the reefs, and a curious incident occurred when I was at anchor at the island of Peru. The ship was attacked by a swordfish, which drove its sword completely through the side, and, being stunned by the concussion, was captured and brought on board.

The large sea-going canoes in which the natives pass from island to island are marvels of ingenuity. The hulls are composed of thin boards in short lengths, accurately fitted together and bound to a framework. No nails are used, the whole being tied together with sinnet. An outrigger of a single shuttle-shaped piece of light wood is always kept upon the windward side, the tack of the sail being shifted from end to end of the hull when going about. The lines are graceful, but the side of the hull facing the outrigger is almost straight. I remember sitting on the beach at Apamama and watching a fleet of nine of these great canoes beating up the lagoon, their great triangular mat sails standing like boards as they made short tacks on the smooth water of the lagoon. They had come from the island of Kuria, 15 miles away, and had accomplished during one night what, on account of the current, had occupied the ship I was in a period of nine days. The dimensions of one I measured were—length, 72 feet; depth from deck to keel, 6 feet; beam, 6 feet; length of outrigger, 50 feet; diameter of outrigger, 18 inches; distance of outrigger from hull, 30 feet. As there are no trees of sufficient size growing upon the islands to furnish planks for these large canoes, the natives depend upon driftwood or an occasional wreck to supply them.

Flora of the Gilbert Group.

The following list of the flora of the group is compiled from observation at the different islands I visited, and is, I believe, nearly complete. As was to be expected from the nature of the islands, it is but a scanty one, and consists of species widely distributed throughout the eastern seas of Asia and the Pacific, and whose seeds are for the most part adapted to survive long periods of immersion in salt water.

1. Cocos nucifera. The coconut.
2. Pandanus odoratissimus.
3. Morinda citrifolia.
4. Scævola Kœnigii.
5. Guettarda speciosa.
6. Calophyllum inophyllum.
7. Ficus, sp.
8. Pemphis acidula.
9. Tournefortia argentea.
10. Abutilon, sp.
11. Boerhaavia diffusa.
12. Tribulus cistoides.
13. Fimbristylis glomerata.
14. Euphorbia, sp.
15. Rhizophora, sp. Mangrove.
16. Crinum pedunculatum ?

17. Ipomœa, sp. A convolvulus.
18. A low-growing plant with yellow flowers; species undetermined.
19. A species of grass.
*20. Caladium cordifolium.
*21. Musa sapientum.
*22. Artocarpus incisa.
*23. A gourd.

Fauna of the Gilbert Group.

The only wild mammal I met with was a small species of rat, common on all the islands. I was prepared to hear of the occurrence of bats, but I met with none, nor do they appear to be known to the natives.

Dogs, cats, and pigs are domesticated, and exist in small quantities.

Birds.

Fowls of the small wild breed, resembling a game fowl, usually met with in the Pacific, run wild in the bush on most of the islands, and a white trader on Onoatoa had introduced pigeons, which appeared to thrive, feeding on the reef at low water.

With the above exceptions, I met with no land birds, and I believe I can confidently say that none exist. Shore and sea birds were numerous, and I noticed the following species:—

Frigate bird,[†] Fregata aquila.
Curlew, Numenius tahitensis.
Booby, Sula, sp.
A plover, Charadrius fulvus.
A crane, Demiegretta sacra.
The noddy,[‡] Anous stolidus.
The tropic bird, Phaeton rubricauda.
The boatswain bird, Phaeton ætherius.
Two species of sandpipers and an oyster-catcher.

Lizards.

A small lizard, Scincus sp., was seen on all the islands I visited.

A gecko, possibly Gecko oceanicus, was also not uncommon.

Arachnida.

1. On Apamama I found a small scorpion while searching among the débris of an emptied copra-house. It was the only one I saw.

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[*] The four last are, doubtless, of native introduction. The banana and bread-fruit were evidently unsuited to their surroundings.

[†] These natives catch and partially tame the frigate bird, and employ it to convey messages from island to island. I was informed of this fact by the natives, but was loth to believe it. At Apamama I saw, however, three of the birds kept upon T-shaped wooden perches opposite the king's house. A long line was tied to their tails. When wild birds were seen, some fish were thrown upon the ground, and the captive birds made to take wing. By this means the strangers were induced to settle, and while engaged in feeding on the fish, a line at the end of a rod about six feet long, having at the end a stone about the size and shape of a fowl's egg, was thrown over them, whereby their wings became entangled and they were caught. I saw the tame birds and the apparatus for catching the wild ones; but although some were seen, they could not be induced to settle, so that I missed seeing the most interesting part of the performance.

In confirmation of the above, I quote the following passage from the Rev. Dr. Turner's book 'Samoa':—

"While I was in the pastor's house on Funafuti (Ellice group), on a Sunday afternoon, a bird arrived with a note from another pastor on Nukufetau, 60 miles distant. It was a foolscap 8vo leaf, dated on the Friday, done up inside a light piece of reed, plugged with a bit of cloth, and attached to the wing of the bird. In former times the natives sent pearl-shell fish-hooks by frigate birds from island to island."

[‡] I found the noddy breeding plentifully upon the island of Kuria, the nests being placed in the tops of the pandanus trees.

2. A spider of the family Epeïra was common on all the islands.

3. On Apamama I also saw a spider of the family Salticus.

Coleoptera.

The following list was compiled from the collection brought home by me :—

Amarygmus, sp.
Pantopœus griseus.
Coccinella transversalis.
„ arcuata.
Necrobia rufipes.
Tribolium ferrugineum.
Dermestes, sp.
Carpophilus, sp.
Silvanus, sp.
Carcinops? sp.
Trogosita mauritanica.
Alphitobius piceus.
„ diaparinus.
Sitophilus, sp.
Adelocera modesta.
Monocrepidius, sp.
Nacerdes, spp. (2).
Genus allied to Tribolium ? sp.

Hymenoptera.

1. A leaf-cutting bee of the genus Megachile was very common on all the islands, making its nest under the thatch of the houses, and using portions of the leaves of *Morinda citrifolia* for the construction of its cells.

2. A small black vespa, with two bright sulphur bands on the abdomen, and some spots on the thorax of the same colour, making its cells in holes in the posts of houses.

3. *Evania appendigaster* was observed on shore at Apamama, and it was common on board the ship.

4. A reddish-brown ichneumon was common on all the islands.

Three or four species of small ants were common on all the islands, and the firewood taken on board at different places swarmed with them.

Neuroptera.

A lace-wing fly, apparently *Chrysopa vulgaris*, was common everywhere.

Lepidoptera.

Two species of butterfly were plentiful.

1. *Hypolimnas rarick*, the larva feeding upon abutilon.
2. *Junonia villida*, feeding upon *Scævola Kœnigii.*

Of moths I took eleven species in the Gilbert group. These, together with some taken at Nukufetau, in the Ellice group, have been described by Mr. Butler in a paper in the *Annals and Magazine of Natural History* for March, 1885. The species are as follows :—

1. Chærocampa erotoides.
2. Cephonodes hylas.
3. Deiopeia pulchella.
4. Prodenia retina.
5. Amyna octo.
6. Heliothis armigera.
7. Catephia linteola.
8. Achæa melicerte.
9. Remigia translata.
10. Marasmia creonalis.
11. Chloanges suralis.*

Diptera.

I noticed once or twice a small fly, apparently a Syrphis. Mosquitoes occurred on some islands; on others, as at Kuria, I did not notice them.

The common house-fly was plentiful.

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* Mr. Butler described this insect as a new species, under the name of *Margeronia Woodfordi*, but has since identified it with *Chloanges suralis* of Zeller.

Hemiptera.

I obtained one specimen of an heterocerous bug on the island of Taputuea.

Orthoptera.

A small species of blatta was common throughout the group, but although they swarmed on board ship, I do not remember noticing on shore the large cockroach, *Blatta orientalis.*

A locusta, resembling strongly *Locusta viridissima,* but probably belonging to the genus Conocephalus, was occasionally seen.

A species of earwig was common among the débris of copra-houses.

Dragon-flies of the three following species were observed, and appeared to be particularly numerous:—

1. Anax guttata.
2. Pantala flavescens.
3. Trithemis bipunctata.

In my endeavour to account for the presence in these remote islands of the fauna that I found inhabiting them, I have arrived at the following conclusions. The rats appear to be of a species common to the islands in this part of the world. I have noticed them from the Solomons to Fiji. They are doubtless carried from island to island by ships. The lizard and gecko must also have been introduced by ships, or their eggs may have reached the islands upon floating timber. During my residence in the Solomons, where lizards are particularly plentiful, I suppose it is the rule rather than the exception for one or more lizards to be unwilling passengers when one of the large native canoes is at any time put into the water. On one voyage from the Solomons to Australia, I remember that a lizard frequented the foretop for several days; and on two occasions, when bringing orchids to Sydney from the Solomons, I have, on opening the case, found a living gecko among the plants. They are easily brought on board ship among the firewood, and their presence, therefore, even upon remote islands, supposing that they are occasionally visited by ships, presents little difficulty.

The fowls were, of course, introduced by human agency, and the remainder of the avian fauna consists of shore and sea birds that frequent the islands and reefs in this part of the world.

Of the insect fauna, the scorpion, spiders, most of the beetles, *Evania appendigaster*, the ants, the blatta, and the earwig, were most probably conveyed to the islands by ships.

The remaining insect fauna, comprising the butterflies, eleven moths, three species of hymenoptera, one of hemiptera, the locusta and the dragon-flies, were probably wind-borne, and I think that such of them as are not of almost cosmopolitan range most probably reached the group through the Marshalls.

Of the two species of butterflies, *Junonia villida* is generally distributed throughout the Pacific Islands, but *Hypolimnas rarick*, so far as I know, although found in the Marshalls, does not extend further to the south-east than the Gilbert group. Of the moths, Nos. 1, 3, 4, 5, 6, 7, and 10 may be said to be cosmopolitan, extending throughout the East generally, and to the more remote islands of the Pacific from Australia to Tahiti.

No. 2, *Cephonodes hylas*, is also found in West Africa, South Africa, Natal, North India, Moulmein, Moreton Bay, and Japan. Being a very handsome and conspicuous insect, it would not be likely to escape observation; but I never observed it in the Solomons nor in Fiji, so that its range into this group was most probably through the Marshalls.

No. 9, *Remigia translata*, is recorded from Ceylon and from the Marshall Islands. I also met with this insect in the Ellice group.

No. 11, *Chloanges suralis*, occurs in Amboina, in the Marshalls, and Mr. Matthew took it in the Ellice group. Its food-plant occurs commonly in Fiji, but I never noticed the insect there, nor is it recorded among the extensive collection made there by Mr. Matthew. I did not notice it in the Solomons.

It appears probable, therefore, that the three last-named species have reached the Gilberts *viâ* the Marshall group. Two of them have travelled on to the Ellice group, but, so far as is known at present, have not extended further. To dragon-flies, at all events, the passage of large distances of sea presents few difficulties. I have on several occasions, during my travels in the Pacific, noticed their larvæ in the water brought on board ships when filling up the tanks. Once on the voyage from England to Australia a dragon-fly was flying about the ship, the nearest land at the time being the island of Socotra, distant about 500 miles. The habit that these insects have, as noticed by me in the Solomons, of flying after dark would most certainly conduce to the chance of their being blown out to sea, and so dispersed from island to island.

ATTEMPTS TO ASCEND MUSTAGH-ATA.

By Dr. SVEN HEDIN.

In 38° 21′ N. lat., the highest peak of the Kashgar chain, and of the whole of the Pamir plateau, Mustagh-ata, raises its head, covered with eternal ice and snow, to a height of about 25,000 feet above the sea. Thus, in respect to its geographical situation, this mountain plays the double *rôle* of being the strongest eastern outpost of the Pamir plateau, and the last north-western outpost of the earth's highest culminating points, which all belong to the Himalaya, Karakoram, and Tibet mountains. Among Mustagh-ata's nearest neighbours, it is the Karakoram peaks, Godwin Austen and Dapsang, that exceed it in height, while Hindu Kush's highest summits, Kauffmann peak and Tengri Khan, are not so high. Thus west of Mustagh-ata there is no mountain, either in the old or new world, which in height can compete with this giant.

The geographical researches of recent years have proved that the Pamir plateau, far from being a plateau in the proper meaning of the word, is a mountain mass cut up into the most varied forms of relief, although subject to the orographical law that mountain chains run in a latitudinal direction. Between these mountain chains the sources of the Amu Darya run towards the west, through valleys which in the eastern half of the highland are broad, and separated from each other by low mountain ridges, but which in the west become more and more deeply cut, and more wild and steep. As the Pamir plateau is bounded on the north by two parallel mountain chains, Alai and Trans Alai, and on the south likewise by two, the Wakhan and Hindu Kush mountains, so also is the case in the east, where the complicated mountain centre is encircled by two parallel, meridional chains, Sarik-kol and Mustagh, or, as it is also called, the Kashgar chain. But while on the north and south the two outermost mountain chains, Alai and Hindu Kush, form the watersheds, the former between Amu Darya and Sir Darya, the latter between Amu Darya and the Indus, so on the east it is the innermost chain, Sarik-kol, which forms the watershed between Amu Darya and Tarim. Thus comparing the Sarik-kol and Mustagh chains, we find that, although the latter is much higher and more strongly developed than the former, it is nevertheless this one, Sarik-kol, which, in respect to its hydrographic importance, plays the chief part, separating as it does two river districts, whose innermost boundaries, the Aral Sea and Lob Nor, lie at a distance of over 30° from each other. As a result of the fact that Mustagh (not to be confounded with the more southerly Karakoram Mustagh) is included in the Tarim river district, this chain, in respect to its formation, is more developed, and shows more bizarre and wild surface-forms than Sarik-kol. The watercourses which run eastward from this watershed must pass the Mustagh chain in order to reach their destination; and Yarkand Darya, the mightiest river of the Tarim basin, Gez Darya, and Markan Su—both of the latter belonging to the Kashgar Darya river district—actually break their way through this chain by deep-cut transverse valleys, frequently bounded by perpendicular walls of rock. Lastly, we find that the average ridge-height (*mittlere Kammhöhe*) of the Sarik-kol chain is far inferior to that of the Mustagh chain, but that the average pass-height (*mittlere Passhöhe*) of the two chains is probably the same; yet, if one considers the relatively insignificant absolute height of the three deep transverse valleys, the average pass-height of Sarik-kol is possibly even higher. That is, in other words, the difference between the average pass-height and ridge-height of the Sarik-kol chain is much less than that of its eastern neighbour. A similar relation between pass-height and ridge-height we find also in the two chains Kwen-lun and Himalaya.

From that part of Pamir where Aksu, Kosh-agil, and Rang-kul are situated, and where one can speak of a plateau in the real meaning of the word, the ground rises slowly up to the generally broad and rounded crest of the Sarik-kol chain, only to fall again just as gradually on the east side toward the Sarik-kol valley. Of the three passes that I know by my own experience, Chuggatai, Muskuran, and Sarik-tash, none offer any difficulties worth mentioning; and Ak-berdi, Kara-tok-terek, and Yol-tok-terek are said to be equally easy. The Mustagh passes, which only need to be used during that portion of the year when the Gez-Darya route is impassable on account of the great quantities of water, are, on the whole, higher and more difficult. Kok-moinak, which I passed on July 5, is the easiest. Through Keng-kol, Tar-bashi, and Chit-jekli-davan one ascends gradually to the pass, from which a way leads down through the Derschet valley to the Tagarma plain. Merkebel (north-east of Mustagh-ata), which I visited October 12, is much more difficult. On the crest of the chain, here somewhat cut up, a broad and thin glacier-tongue, comes down from the mountains south of the pass on either side; but especially on the east, it has formed great moraines, which in a high degree render passage more difficult. Kara-tash-davan, which lies somewhat north of Merke-bel, is said to be considerably easier than this, and also constitutes an important route between north Sarik-kol, and Kashgaria. Still farther north (north of Gez-Darya) we find the two passes Buru-kiss and Ulug-art, which, like Merke, are extremely seldom used. These passes are very unfavourable, for during six months of the year (from the end of September) they are blockaded with snow and ice; and even during the summer one must here, as at Merke, ride over the glacier-tongues.

MUSTAGH-ATA FROM THE SOUTH-WEST.

The Mustagh chain is, on account of its situation and its considerable height, more exposed to the moisture carried to these parts by southern winds than the Sarik-kol mountains, which therefore, at least in the parts I visited, have no glaciers, and only in a few limited tracts have perpetual snow. Thus in a climatic respect the Sarik-kol chain belongs to the Pamir plateau with its dry atmosphere, while the Mustagh chain forms a more isolated climatic district, on whose slopes and heights the air, laden with ocean moisture, has caused the formation of continuous fields of perpetual snow and firn-snow which cover the heights, and mighty glaciers, which in deep ravines flow down the mountain-sides. The eastern slopes of the chain facing towards the dry climatic district of Eastern Turkistan, are, consequently, poorly supplied with glaciers, which are, however, all the more plentiful on the western slopes. This grand glaciation doubtless protects the Mustagh chain from weathering, while the Sarik-kol chain, which rises in dry strata of air, has already lost its original ice-mantle, and has therefore gradually been more and more exposed to weathering, and, compared with its neighbour, has rapidly decreased in height. On account of the considerable average height of its passes, the Sarik-kol chain, nevertheless, is still the watershed—the only remnant it has retained of its former greatness and splendour, a circumstance which causes us to suppose that in ancient times it equalled or perhaps exceeded the Mustagh chain in height.

Although the extent and magnitude of the glaciation has, in the course of ages, decreased even on the Mustagh chain, and is slowly decreasing still, the glacial geologist or the alpinist finds here an inexhaustible field for observation. That the territory covered with glaciers was formerly vastly more extensive than it is now, is proved by the more or less weathered and eroded moraine débris which still cover the lower slopes of the mountain, and in places even blockade the Sarik-kol valley. One of these moraines which stretches across the valley has dammed it up, and caused the formation of Little Kara-kul and the two basins called Bassik-kul, and it is probable that even the lakes Chakeragil and Balun-kul have been formed in the same manner. Erratic blocks as large as 1000 cubic metres are by no means uncommon, and their situation, the kind of rock of which they are composed, and their polished or striated surfaces betray in an unmistakable manner their origin. During last summer on Mustagh-ata—*i.e.* the culminating point of the chain, which on our maps is frequently erroneously called Peak Tagarma—I explored seven large and several small glaciers; but, on account of the extent of the work, did not have time to fulfil my plan, which was to extend my researches even to other parts of the Mustagh chain. From Bassik-kul alone, there are no less than twenty-one glaciers visible on this chain.

Mustagh-ata (the "Father of Ice Mountains") is composed of gneiss of all colours and forms of structure, from coarse-grained and porphyritic gneiss (*augengneiss*) to fine-grained, with a transition to crystalline slate. On the northern portions of the mass slate is predominant, and gneiss in the southern part. The mountain is divided into two distinct parts, between which the mighty Jam-bulak glacier (which Bogdanovich named the Prjevalski glacier) has its firn district and its tongue. North of this rises an isolated summit, which can be ascended only from the west, close by the glacier-passage. To the south lies the main mass of the mountain with four summits, of which the northernmost is the culminating point. Viewing Mustagh-ata from the west, for instance from Murgab, it may be plainly seen that these four summits, near their tops, gradually melt together into a cupola. On this cupola the armour-ice, which covers it like a calatte, is fully developed and of an enormous thickness. It is formed of firn-snow in the very highest regions, and slides down to the glacier collecting-basin; but even between the glacier-passages it reaches down in broad, thinner, and still thinner tongues or wedges. The larger glaciers generally disappear at a height varying between 12,800 and 13,500 feet.

JAM-BULAK GLACIERS.

Mustagh-ata is a holy mountain. The Kirghiz frequently fall on their knees and pray when they pass by it, or when they first come in sight of it on a journey. The bones of seventy-two saints rest here, and the mountain is considered to be one great masar or grave of saints. Among those that here have their resting-place is Moses (wherefore the mountain is also called Hasrett-i-Musa), together with the prophet Ali, who, when he felt death approaching, predicted to his people that, when life had fled, a white camel would come from heaven and carry him away. After his death, the camel came, took the prophet on his back, and sped away to Mustagh-ata.

The Kirghiz of this district told me that only an old *ischan* had, many hundred years ago, ascended this holy mountain. There he had found a lake and a river, on whose shores a white camel grazed. In a garden, where plum-trees grew in great abundance, old men were wandering about in white garments and with long white beards. The *ischan* ate of the fruit of one of the plum-trees, and then an old man came up to him and said that this was fortunate for him, for had he despised the fruit, he would have been compelled to stay eternally on the mountain like the other old men. A rider on a white horse then took him on his saddle and rushed off down the steep descent with him. When he came down into the valley, he had only a faint recollection of what had happened.

Once when the celebrated Khan Khodya was waging war against the Chinese, he was about to be overpowered at Little Kara-kul. At the last moment, forty stalwart horsemen on jet-black horses rushed down from Mustagh-ata and won the victory for Khan Khodya. In his army there was a hero, the *palevan*, Chum-kar-kashka-Bater, who had been told by his master never to look back when surrounded by the din of battle, and that if he heeded this advice he would always conquer. In three battles he did as his master advised him and conquered, but in the fourth he looked round, and was instantly hit by a fatal bullet. His *masar* (grave) is on the west slope of the mountain, where a whole tract of country still bears his name. The Kirghiz still relate that on the top of the mountain is an ancient city, Janaidar, which was built at a time when the people on the earth were all happy, and since, from that time till now, there has been no communication between this city and the rest of the world, its inhabitants are perfectly happy even to this day. There are gardens here that bear the most delicious fruits the year round; there are beautiful women who never get old; all the enjoyments of life are as common as daily bread; only death, cold, darkness, and misfortune are not to be found there.

Contemplating the projected journey to Mustagh-ata, I collected all possible information in regard to it from the Kirghiz. With one voice they told me that an ascent would be impossible: precipices and abysses hindered all progress; the sides of the mountains were covered with ice as smooth as polished steel, and the storm-king, who reigned supreme up there, would sweep us away like grains of sand; we should never come back alive. The Kirghiz in the neighbourhood of Su-bashi and Little Kara-kul, *i.e.* immediately at the north-western foot of the mountain, were less pessimistic in their opinions than their brethren in the interior of Pamir. Most of them were willing to accompany me and exert their strength to the utmost; but they believed, nevertheless, that the expedition would be a failure. Hunters who had strayed to a considerable height had become dizzy in the "heavy" air; and once, when a party of hunters had driven *arkaris* up against the steep ice-walls, even these agile and quick-footed animals had shrunk back. Even the wings of the eagle became benumbed before he reached the highest regions.

To attempt the ascent of such a mighty mountain as Mustagh-ata without an experienced and skilful Swiss guide is doubtless a risky undertaking, and one must entirely confide in one's own judgment and the Kirghiz instinct of locality. I found, however, many among them who were invaluable followers, and displayed an admirable perseverance. Experience has shown, and experiments with animals in rarefied air have confirmed the fact, that, in ascending mountains, it is not so much the rarefaction of the air which brings on fatigue and decrease of strength, as the physical exertions to which the climber is exposed. The increased muscular labour requires a greater supply of oxygen, but the quantity of oxygen decreases, instead, the higher one ascends, and at a certain height every distance of 10 feet is dearly bought, till finally a limit is reached where one's strength is no longer sufficient, and the limbs refuse to serve the body. If one wishes to reach a considerable height, one must consequently try to arrange the ascent in such a manner as will best spare one's own strength, and no one has a better opportunity of doing so than the aëronaut, who can, therefore, without special difficulty, live in air-strata considerably higher than the earth's highest mountains. If the ascent of mountains could be arranged in some such manner, it would not be difficult to reach the highest summits of the Asiatic mountains. But as long as it is not practicable to use balloons in ascending mountains, one must be satisfied with the means of ascent which are to be had. One of the most practical and simple means which the traveller could wish, for facilitating the ascent, is to be found at the very foot of Mustagh-ata, where the Sarikkol Kirghiz of the Kara-teit and Neiman tribes pasture their great yak herds. Among these strong and tenacious animals, inured to the rarefied air, one only needs to choose a few of the best, in order to be helped a good piece on the way. In the four ascents which I made I always used yaks, which, without any apparent exertion, climbed as high as 19,500 feet, so that even at this considerable height, where the snow lies deep, I did not feel any loss of strength worth mentioning.

During February and March, 1894, I rode over Russian Pamir, and arrived in the middle of April at the western foot of Mustagh-ata, where I was received in a very friendly manner by the Kirghiz. We planned a complete campaign against Mustagh-ata, and we intended to do everything to conquer the giant. We were to lie in ambush, watch for an unguarded moment—that is to say, for favourable weather—and then make the attack. Since the distance from the valley to the summit is very great, it was decided to plant a depôt as high up as possible, from which we could reconnoitre and advance.

On the morning of April 17, therefore, a picturesque alpine caravan stood waiting outside of my *yurt* (tent). The caravan was composed of six weather-beaten Kirghiz clad in warm sheep-skin great-coats, and with staves in their hands, nine large black yaks, and two sheep. The yaks were laden with necessary provisions, spades, crowbars, axes, ropes, fur overcoats, blankets, a photographic apparatus, etc. The more delicate instruments (thermometers, psycheometers, boiling-point thermometers, aneroids, and field-glasses) were carried in satchels by the Kirghiz. The other yaks were saddled, and we mounted, and began a slow march up the mountain in a south-south-east direction. The yak is guided by a rope run through the cartilage of the nose, but, however vigorously one protests, he goes along as he himself pleases, with his nose to the ground, and his heavy breathing sounds like the puffing of a distant steam saw-mill. We passed a glacier-tongue (the first one), whose light green ice shone on the slope; below its terminal moraine lies a block of gneiss broken in two. This track of country is called "Kamper-kishlak," or the old woman's village (*kishlak* properly means "winter pasture," as distinguished from *jejlau*, which means "summer pasture"). Tradition tells us that when the Shah of Shugnan waged war against the Kirghiz, they all fled except an old woman, who hid herself between the two halves of the gneiss-block, and thus escaped. The ascent is very steep; nowhere is there to be seen as yet any solid rock, but the whole ground is covered by gneiss blocks and ancient moraine heaps.

Towards evening, at a height of 14,500 feet, we reached a snow-free place lying between moraines and protected from the wind. Here we encamped. With the aid of felt mats, alpine staves, and ropes, we made a temporary bulwark on the south side of the camp. Later in the evening a Kirghiz arrived with two more yaks laden with *tesek* (yak-dung), and a large fire was kindled in the open, where we sat down to make a meal on mutton. Then the moon rose behind the mountain, surrounded by a resplendent corona. The fire was allowed to go out gradually, and we slept calmly under the bare heavens, on the mountain of Hasrett-i-Musa.

The next day, April 18, was unfavourable. The sky was covered with clouds; it was cold and windy; but we decided, nevertheless, to make an attempt to proceed. We were to take only three yaks with us, for the Kirghiz preferred to go on foot. In sharp zigzags we worked slowly up the slopes, which became steeper and steeper. The yaks are very surefooted, but rest often. When the clouds at intervals cleared away, the most glorious pictures presented themselves to our views. The whole of the Sarik-kol valley lay below us, spread out like a map. To the north we could see Little Kara-kul and Balun-kul; to the south-west, the mountain chains of Murgab; and deep down below us, on the western side, the grave of Chum-kar-kashka-Bater, on a height that from the valley looked like a great mountain, but from here like a little hill.

When we arrived at the northern marginal rocks of the Jam-bulak glacier, we stopped to make a few observations. We were here at a height of 16,000 feet, and had, therefore, all the mountains of Europe beneath us. Proud as a king, the glacier comes forth from its castle-gate, a deep and broad fault (*Grabenversenkung*), which divides the mountain into the two above-mentioned parts, and which throughout its entire length is filled by the colossal masses of the glacier. In three places this glacier passes steep falls (*Sturz*), causing whole systems of deep, gaping, transverse crevasses. Between these are cubes or pillars of crystal-clear though partly snow-covered ice, which, however, through ablation are gradually rounded off, and in the lower parts of the glacier-tongue, form a chaos of pyramids, which make this glacier very difficult to cross. Afterwards I visited it several times, but could never succeed in getting more than half-way over it. Its left half is so cut up by crevasses that there is no possibility of making one's way across it. Where the glacier issues from the rocky passage formed by the fault, it spreads out to double and treble its original width, and becomes in the same proportion thinner. But even here I measured crevasses as deep as 60 feet, from which may be inferred that the thickness of the ice in the rock-passage itself must be enormous. From the point where we were now, we had a good opportunity of observing the contour of the whole glacier-tongue, and the longitudinal, transverse, and marginal crevasses which, like a net, cross and recross its surface. The lateral and terminal moraines which now form high walls around the ice-margin, the old moraines which have long ago been

THE FIVE CULMINATING PEAKS OF MUSTAGH-ATA, FROM THE SARIK-KOL PASS.

deserted, bottom-moraines on which the glacier formerly stood, the glacier-brook with its steel-blue silt,—all could be seen very plainly.

When we had reached a height of about 15,150 feet, where water boiled at 82·53° C., and where the temperature sank to 4·5° C. below freezing-point, we were overtaken by a *buran* (snowstorm), so violent that we were obliged to lie still for several hours before we could, even with the greatest caution, begin the descent through the fresh snowdrifts which now treacherously concealed the ground.

We remained two days more at the depôt, but the weather now became very unfavourable, and the snowstorm raged even down in the Sarik-kol valley. I had, besides, contracted inflammation of the eyes, which compelled me to hurry in forced marches to Kashgar, where I was received by the Russian consul, Nikolai Feodorovich Petrovski, and his wife with the same extraordinary hospitality as they showed me four years ago. During the two months which I spent with them, I frequently had the pleasure of again seeing Mr. George Macartney. The first unsuccessful attempt to ascend Mustagh-ata incited me to revisit the mountain, and I therefore decided to devote the whole summer to a thorough exploration of it. Thus on June 21, with a little caravan, I marched back to Sarik-kol *viâ* Kok-moinak and Tagarma, and at Su-bashi engaged Kirghiz and yaks and hired a Kirghiz tent (*uj*).

We spent two weeks at Little Kara-kul and Bassik-kul, which tract of country I mapped with topographical instruments to serve as basis for our operations on future excursions. After this work was done, we broke up and started off in a south-easterly direction. For ten days we explored the north-western slopes of the mountain, together with the five mighty glaciers which flow down in this direction from the central firn district; and when this was done, we established a permanent depôt at the height of 14,400 feet, below the place where we tented in April. From this point we had the most glorious view of the Sarik-kol valley and the nearest mountain chains of Pamir, and in our immediate neighbourhood three mighty glacier-tongues were melting in the sun. The hospitable Kirghiz supplied us with provisions, which very much facilitated our sojourn in this barren and sterile neighbourhood, among ancient moraines long ago deserted by the ice.

From the temperate summer and smiling shores of Kara-kul, we had come up into a real polar winter, and near the end of July we had daily snowstorms for a whole week, and the weather seemed to present insurmountable obstacles to an ascent. If it did not snow, it hailed, and if clear weather, there was a penetrating and icy north wind which, higher up on the mountain, drove up the firn snow in thick white clouds; and if it was calm and sunny for a little while, we hoped in vain for a fine day, for in a quarter of an hour the sky would again be covered with clouds, and the hail would be lashing the sides of the mountain. Frequently the yaks stood saddled, the instruments and satchels were divided among the carriers, and we were just about to break up, when the storm would come down upon us and annihilate the plans of the day.

In the beginning of August the weather was glorious, and on the 5th we prepared for an ascent the next day. The day had been fine, but as twilight came on, the usual hail and wind began. The mountain, which with its white fields of snow and ice lately shone in dazzling splendour, was again enveloped in thick clouds, and towards evening Æolus danced a mad ring-dance around one of his highest thrones. On the 6th, however, our hope did not disappoint us. With five Kirghiz and seven yaks we broke up before sunrise, and started up the slope situated on the right or north side of the Jam-bulak glacier, which flows to the west—that is to say, the same place where we had failed in our ascent in April. After an hour's climbing, Mount Rosa (15,310 feet) was beneath us, and after still another hour we had ascended higher than Mount Blanc (15,930 feet); but full two hours were passed before we reached the height of Mount St. Elias (18,200 feet), and then we strove to climb to the height of Kilima Adyaro (19,800 feet), and with great exertions we succeeded in nearly reaching this altitude.

SARIK-KOL PLAINS.

The snows were very favourable, and did not hinder the ascent in any large degree. At the height of 16,350 feet we passed the snow-line. The snow lay here in small fields, interspersed with patches of gravel;

then a continuous field, which, 650 feet higher up (perpendicular height), was covered with a thin crust, and was packed so hard that the men's leather boots left no marks. The snow became deeper the higher up we came, from a few centimetres to one and two decimetres; but at the highest point we reached, it lay as yet only 15 inches deep. On the right lies the Jam-bulak glacier, between its two perpendicular rocky walls of gneiss and crystalline slate.

During the ascent three of the Kirghiz fell behind, because they suffered from a splitting headache, and with the two others I continued till I reached the height of 19,450 feet, where the lie of the ground became different. A very steep slope, which higher up gradually developed into the flattened cupola of the summit, stretched up before us, and was covered with deep snow, whose surface was crossed by fissures and faults (displacements or dislocations?), showing a tendency to form avalanches. The Kirghiz warned me, and with due cause, not to set foot on this steep slope of snow, which every moment threatened to fall, for the yaks with their great weight might easily cause an avalanche, which would surely be fatal to us all. The men said that, from the valley below, they had sometimes seen avalanches. The snow whirled up in great clouds and swept down the slopes. When it stopped, it seemed to be changed to ice at the bottom. Since the day was nearly at an end, I gave orders to return. We had learned that *one* day was not enough to reach the distant summit, and that it was therefore necessary to establish still another depôt.

During the following days we explored three of the largest glaciers, Chal-tumak, Tergen-bulak, and Chum-kar-kashka, which all flow to the west, *i.e.* towards the Sarik-kol valley. On the left or south side of the first-mentioned glacier, we attempted a new ascent on August 11. The night had been rather cold (4·8° C. below zero), and in the morning thin layers of ice lay between the stones in the glacier-brook, which had now shrunk down to an insignificant rill, more muddy than usual, since the clear brooks from the melting snow and ice in higher regions, and from the surface of the glacier, were probably frozen. The weather was, besides, especially favourable. Not a cloud was to be seen; only a light breeze was stirring, which gradually died away.

On the whole, the surface-forms of the ground are similar to those of Jam-bulak; at Chal-tumak we also find a mighty glacier, whose bed is in a passage cut deep into the mountain. Here the whole of the firn district lies plainly before us, and above it rises Mustagh-ata's highest summit, clad with steel-blue ice, which stretches down in all directions over the mountain-slopes, between the glaciers, in broad, thin, and still thinner tongues. Quite near the verge of that precipice which rises perpendicularly from the surface of the Chal-tumak glacier, the slope is bare and strewn with fine detritus, forming a ridge, which runs upward in the form of a gradually tapering wedge, and disappears, at the height of 15,600 feet, under the ice. This scale of ice was covered near its lower edge with compact snow from 3 to 5 inches deep, which kept the yaks from slipping, although the slope here had an inclination of 24°.

We had an opportunity of witnessing a stately glacier-avalanche from a protruding part of the ice which runs from the right into the Chal-tumak glacier, and whose obtusely broken tongue, smooth as polished steel, gleams in lines ranging from light green to marine blue at a height of 1000 to 1300 feet above the surface of the main glacier. At this height it forms a so-called hanging glacier. Slowly gliding down the mountain-side, it gradually projects over the verge of the precipice, till enormous fragments of the overhanging mass of ice break off and fall into the chasm below, and are dashed against the protruding spurs of rock and ground to fine white powder, forming, on the surface of the main glacier, a conical heap as white as snow, although some detritus has been brought with it in the fall. Here the ice-powder again melts together, and forms a tolerably clear ice-stream, which, on the back of the main glacier, slowly glides down towards the valley. It is a regenerated glacier—a parasite glacier.

We had not gone far on the ice-sheet before we went astray among the transverse crevasses of the tongue of armour-ice which crossed our way. To begin with, these crevasses were only a foot wide, but the higher we ascended, the wider they became; but they usually tapered out on both sides, so we could frequently go around them. The longest were crossed on snow-bridges. Most of them, however, were not discovered till the yak plunged his fore legs into them, but he always skilfully and agilely raised himself by pressing his nose against the opposite edge. Here the depth of the crevasses did not exceed 32 feet.

Higher up the ground became less dangerous, the crevasses being fewer and narrower; but the depth of the snow increased to 16 and 20 inches, and the yaks forced their way slowly through the drifts like snow-ploughs. Thus for some time we ascended on steadily rising ground, and hoped to find a passage between two enormous protuberances of ice, whose perpendicular clear surfaces shone in the sun. We were getting on very well, when all of a sudden the first yak disappeared in the snow, all except his horns, his right hind leg, and the pack on his back, which still stuck up through the snow. He had broken through a crevass in the ice more than a yard broad, and was held up only by his pack, which protruded over either edge of the hole in the vault of snow. Fortunately he lay still, and with the help of ropes and a couple of the other yaks, we at last succeeded in pulling him out. The crevass was only 25 feet deep, and through the opening there gleamed a dark blue refulgence. The walls were of clear ice, and the bottom covered with caved-in snow, and from the under side of the treacherous vault there hung ice stalactites, formed by dripping water on warm, sunny days. These crevasses are, however, surely shallow, compared to the whole thickness of the ice covering, which, judging from isolated, broken off ice-masses higher up, must be enormous.

After still another yak and a Kirghiz had come near disappearing in a crevasse which crossed the one above mentioned, it became clear that we had come to very dangerous ground. The worst of it was that the Kirghiz had discovered, in our immediate neighbourhood, a crevasse which, according to their description, was three "yak-lengths" broad; and I could see myself how it stretched from the glacier-passage to one of the ice-precipices, and totally shut off our way. We had taken with us tents, rugs, and provisions; but under such circumstances there was no object in spending the night here, and we consequently returned to the camp, after having reached the height of only 18,750 feet. From this height the gigantic glaciers resembled narrow white bands, disappearing when compared with the tremendous masses of ice which covered the central part of the mountain.

Furnished with complete equipments for two days, and accompanied by six Kirghiz, my Sart servant, Islam Bek, and ten yaks, I again attempted, on August 16, to ascend Mustagh-ata at the same place where we had tried on April 18 and August 6. When we reached the snow-line, we followed our old tracks, which formed a guarantee against accident. The way could be clearly seen, winding in zigzags along the edge of the right-hand rocky wall of the glacier-passage. Since at first the snow-covering was thin, our old footprints were melted into large round hollows, at the bottom of which the detritus lay bare. Higher up, every footprint was filled with blue-green ice; and still higher up, covered with a crust of snow as thin as paper. In some places the track was partly obscured by drift-snow, but never so much so that it could not be discovered and followed, as a safeguard against lurking dangers. Thus there had been no snowfall of any consequence here for the whole of ten days.

When we reached the point where we turned back the last time, we halted and pitched the *yurt* on the slope. To begin with, all of us felt quite well, and we made a large fire of *tesek*, which gave out a good deal of warmth, but filled the tent with suffocating smoke, which made our eyes smart, and but slowly sought its way through the open entrance. After a while, however, the Kirghiz began to complain of headache, and two of them were so bad that they were obliged to return. Among other symptoms which increased in all of us during the night and towards morning, may be mentioned—continued ringing in the ears; slight deafness; faster pulse and lower temperature of the body than under usual circumstances; absolute sleeplessness, probably on account of the headache, which became unendurable towards morning; and now and then small attacks of dyspnœa. The Mussulmans groaned constantly the whole night, as if they had been stretched on a rack; the furs seemed fearfully heavy and oppressive; the lying posture makes breathing more difficult, and one can plainly feel the heavy throbbings of the heart. When the tea and bread were served, nobody ate or drank, and when night came down upon us, the Kirghiz became rather gloomy. Darkness did not last long, however, for the full moon soon rose in dazzling splendour in the black-blue heavens, and called forth the most wonderful and fantastic effects of light on the convex fields of snow, around the deep glacier-passage and in the inaccessible firn district.

MUSTAGH-ATA FROM THE NORTH, WITH THE GORUMDE GLACIER.

The night was desperately long. We all suffered from the agonies of mountain sickness, and gasped for more air. We were fearfully cold, largely on account of a violent south-west wind, which sprang up after midnight, for the minimum temperature fell only to 12° C. below zero. At last the sun rose and lit up our misery; but the coming day was not at all favourable. A nearly hurricane-like wind swept the sides of the mountain, and blew up thick clouds of flour-fine snow about us. Only the nearest surroundings could be distinguished, and to attempt an ascent on such a day would have been to go to certain death. I saw at once how impossible it was, but still clung to the hope that the weather might clear up towards noon. We therefore waited patiently in the little windy tent, into which the drift-snow sifted in thick clouds from all directions, making it impossible to keep up a fire; but about noon it was quite clear that the day was lost, for the storm steadily increased in fury. I therefore gave orders to break up. Three of the Kirghiz had to answer for the tent and the burdens. The rest of us wrapped ourselves up in everything we had, and down we went with the speed of a whirlwind through the snowdrifts. The yaks actually cast themselves headlong into the snow, dived through the drifts with the agility of dolphins, and, in spite of their great weight, never slipped or stumbled a single time. One sits in the saddle as though on board a jolly-boat pitching and tossing in a high sea, and must blame himself if he is not strong enough in his knees to keep in his saddle. Frequently one must throw himself backwards and lie with his back against that of the yak. It is necessary to use every muscle in the body to balance one's self in harmony with the yak's unexpected but agile and ingenious manœuvres. Finally we reached the depôt, where we enjoyed a much-needed rest, but felt during the whole of the next day like convalescents after a protracted illness.

The functions of the body are, as mentioned above, dependent upon the physical exertions and the rarefaction of the air. In this respect, the pulse is more sensitive than the temperature of the body. During our wanderings on Mustagh-ata, I made several physiological observations on the Sart, Islam Bek, from Osh (43 years old); the Kipchak-Kirghiz, Jehim Baj, from Shugnan (40 years old); and on myself (29 years old), and some of these results may be of interest.

		Temperature.	Pulsations.	
July 28, 10 p.m.	Myself	36° Cent.	98	13,550 feet height.
	Islam	36·4° „	92	
	Jehim	35·6° „	66	
July 29, 10 p.m.	Myself	35·5° „	88	14,100 „ „
	Islam	36·3° „	92	
	Jehim	35·3° „	74	
Aug. 5, 9 p.m.	Myself	36° „	88	14,100 „ „
	Islam	36·4° „	90	
	Jehim	36·6° „	84	
Aug. 6, 12 m.	Myself	35·5° „	86	17,200 „ „
	Jehim	35·6° „	82	
Aug. 11, 2 p.m.	Myself	36·2° „	94	18,600 „ „
	Islam	35·6° „	86	
	Jehim	35·9° „	84	
Aug. 16, 8 p.m.	Myself	35·35° „	106	19,500 „ „
	Islam	36·62° „	98	
	Jehim	36·65° „	116	
Aug. 17, 9 p.m.	Myself	36·12° „	102	14,100 „ „
	Islam	36·6° „	82	
	Jehim	36·72° „	84	

Although there are many exceptions, it seems, from the above table, that the general rule is, that the temperature falls and the pulse increases the higher one goes. With me, the temperature of the body usually varied only ½° C., while my pulse remained tolerably even, which doubtless depends upon the fact that I avoided every unnecessary movement of the body, while the men, on the contrary, sometimes went on foot. The greatest variation in the pulse took place in the Kirghiz, Jehim Baj. At the height of 13,550 feet he had 66, and at 19,500 feet, 116 pulsations; that is to say, the pulse increased 50 beats in ascending 6000 feet. The irregularities in the numbers of the table depend, without doubt, upon several outer circumstances—as, for instance, more or less lively movements of the body, individual sensibility to the rarefaction of the air, temporary indisposition, and the like. I always made the observations, however, after a rather long rest, so that shortness of breath, over-heating, and the feeling of fatigue had had time to disappear entirely.

The four ascents of Mustagh-ata taught me, firstly, that one day is not sufficient to reach the summit, to which the distance from the western foot of the mountain, even on a plane, is considerable; and, secondly, that to spend the night at a height of from 19,000 to 20,000 feet is not practical, because the bodily strength thereby speedily decreases, and a distressing headache is brought on. The best way to attain a happy result (although I unfortunately had not time to try it, on account of the lateness of the season, and was also hindered from doing so by the unfavourable and windy autumn weather) is, without doubt, to begin the ascent as early as two or three o'clock on a calm, fine morning in the beginning of July, from a depôt at the height of from 15,000 to 16,000 feet, and to accomplish it all in one day. In this case, yaks must be used to the greatest possible height, and when they cannot go higher, they must be left, and the rest of the ascent must be made on foot. In descending, the yaks may be used from the place where they were left on the way up. The prospects of reaching the highest summit of the mountain (that which rises immediately south of the Jam-bulak glacier's firn district) are, however, according to my opinion, very small; nay, I might even venture to say that it is impossible. The yaks will probably not be able to climb higher than 21,000 feet, for here the snow becomes 2 feet deep and more, and here the ice-covering forms enormous blocks and protuberances, between which broad and deep cracks, often concealed by snow, cross and recross the ice. It is impossible to force one's way with yaks over such ground; here one must depend upon his own strength. Many cracks are too broad to step over, and special appliances must be used, such as glacier-ladders. But even if these and other necessary implements are made as light as possible, their weight will, nevertheless, be very much felt at this height. But the northernmost summit of the Mustagh-ata mass (situated on the north side of the Jam-bulak glacier's firn district), which is, however, considerably lower than its neighbour, may probably be reached. The character of the ground, at least, does not here offer any insurmountable obstacles. Besides, if one succeeds in reaching the neighbourhood of this summit, it is not impossible that a passage might be found over the glacier's firn district to the highest summit, which lies to the south of it. But in making such an ascent, one must take into consideration enormous distances which cannot be travelled in one day, in addition to the height to which one must climb, the snow, and the unfavourable character of the ground in general.

Under all circumstances, in order to make a successful ascent, one must start from the Sarik-kol valley in the west, where one already finds himself at a height of from 12,000 to 13,000 feet, and in which direction the slopes are least steep. From the east, south, and north the mountain is inaccessible.

If an experienced mountaineer like Conway, with a suitable companion and a hardy and experienced Swiss guide, were to make the attempt, he would surely reach a very considerable height, nay, perhaps even the northern summit. But even a Swiss guide, no matter how experienced, will here find himself in strange surroundings, for Mustagh-ata's summit rises 9000 feet above the highest mountain of Europe.

MODERN GEOGRAPHY, GERMAN AND ENGLISH.*

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This is a memorable year for English students of geography. We have entertained in London for the first time a great gathering of our foreign colleagues, and have presented to the British public the unfamiliar spectacle of a geographical meeting, in which scholars and professors were as prominent as explorers. As a nation we may justly claim that for several generations we have been foremost in the work of the pioneer; nor need we view with dissatisfaction our contributions to precise survey, to hydrography, to climatology, and to biogeography. It is rather on the synthetic and philosophical, and therefore on the educational, side of our subject that we fall so markedly below the foreign and especially the German standard, and it is for this reason that we may regard the Sixth International Congress as a noteworthy object-lesson for English geographers and teachers. The time seems, moreover, to have been ripe for some such stimulating influence. To indicate a few signs only of rising courage among our geographers, and of sympathy on the part of the public, I would draw your attention to the institution of afternoon meetings in Savile Row for the discussion of technical questions, to the success of the new Geographical Journal, notwithstanding its geographical as opposed to merely "adventuring" flavour, to the recent formation of a geographical association of Public Schoolmasters, and to the demand for addresses on the teaching of geography on the part of the local branches of the Teachers' Guild. Facts are reminding us once more that the lapse of a certain time is essential to the rooting of a new idea, and we may thank the geographical veterans of 1869 for sowing seed the fruit of which we are now harvesting. That I am not alone in my interpretation of present tendencies is clear from the emphatic opinion of the President of the Royal Geographical Society expressed in his last annual address, that "the time is approaching for a reconsideration of the educational policy of the Society." It would almost seem that we are nearing a development of geographical education not unlike that which nine years ago followed on the publication of Mr. Keltie's valuable report. At that time two of my predecessors in this chair, Sir Frederick Goldsmid and Sir Charles Warren, thought it not unfit to make education the chief theme of their addresses, and encouraged by their example I venture, under present circumstances, to call your attention once more to that subject. Since 1886 and 1887, however, much has happened, and we no longer need to discuss the more elementary teaching of geography. I propose, therefore, to treat of comparative and philosophical geography in relation especially to secondary and university education, and it seems to me that an historical rather than an *a priori* discussion gives best promise of result.

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The middle of the eighteenth century marks an important epoch in the history of geography. In ancient times Ptolemy and Strabo grasped the system and possibilities of our science, but they failed to build high from lack of a broad foundation of precisely recorded facts. Subsequently, geography had its Dark Ages and its Renascence in harmony with the general trend of human affairs. By the end of the sixteenth century Mercator and Ortelius had somewhat more than recovered the Greek position, but still, for another century and a half, geographers wrestled with essentially the same problems as had presented themselves to the ancients. The observers ascertained latitudes and longitudes with ever-increasing precision, the cartographers projected the observed positions on their maps with growing happiness of compromise, and the scholars sought, with the prodigious industry characteristic of the age, to identify the sites mentioned by the ancient authorities. Three names—Harrison, D'Anville, and Varenius—in the several fields of observation, cartography, and scholarship, may be taken as completing this stage of development, although, as is always the case, the new and the old overlapped. In 1761 the chronometer was added by Harrison to the magnetic compass, the log-line, the sextant, and the theodolite, and thus was completed the observer's equipment. In the same year D'Anville published his 'Atlas Moderne,' in which (besides a fidelity of outline greater than that of his predecessors Delisle and Homann) he brought to bear a mechanical finish and a criticism of data that were new to cartography. Only a few years earlier, in 1755, there appeared in Paris a French translation of the 'Geographia Generalis' of Varenius, first published at Amsterdam in 1650, edited for Cambridge in 1681 by Sir Isaac Newton, and reprinted again and again for three generations as the masterpiece of the "scholarly" geographers. Thus, when George III. was still young, the *horizontal* outlines of the map of the world had taken their now familiar form, and school geography consisted of "the use of the globes" with some small attention to classical topography.

What made the eighteenth century a transition age of such importance to geography was the realization of new problems, which both Antiquity and the Renascence had either neglected or utterly failed to solve. These problems allow of most general expression by the use of three convenient terms, two of them lately imported from Germany—lithosphere, hydrosphere, and atmosphere—the first implying the rock globe, whose surface is both land and sea-bed, the other two denoting the external envelopes. The geographer is concerned with the atmosphere, the hydrosphere, and the surface of the lithosphere. His first business is to define the *form*, or relief, of the surface of the *solid* sphere, and the *movements*, or circulation, within the two *fluid* spheres. The land-relief conditions the circulation, and this in turn gradually changes the land-relief. The circulation modifies climates, and these, together with the relief, constitute the environments of plants, animals, and men. Shorn of complexities, this is the main line of the geographical argument. In the language of Richthofen, the earth's surface and man are the terminal links. It is clear that all depends on the accuracy of the first premises—the form of the lithosphere, and the movements within the hydrosphere and atmosphere. Before last century geographers ascertained the horizontal elements in form, but neglected the vertical. In the matter of outline, the maps of D'Anville are an immense improvement on those of Ortelius, but they exhibit essentially the same almost child-like methods for the depiction of relief which had been employed by Buckinck in the 1478 edition of Ptolemy. Until this was remedied the whole superstructure of comparative and philosophical geography lacked any real basis.

Like the letters of the alphabet, conventional hill-shading was evolved from pictures rather than invented. The great atlas of Germany, published at Nuremberg in 1753 by the successors of Homann, consisting as it does of maps engraved in various years extending from 1718 to 1753, shows admirably almost every stage in the evolution. Other striking evidence may be seen in the chart of New Zealand drawn from Captain Cook's surveys, and reproduced by Admiral Wharton in his edition of Cook's Journal. Side by side on the same chart, we have the "ant-hills" of Buckinck and Ortelius, and the "caterpillars" of modern maps; but the latter, like degenerate animals with rudimentary organs, still retain clear marks of their origin. The "ant-hills," elsewhere sown evenly over the land-surface, are in certain parts drawn into chains and foreshortened, or in modern railway parlance "telescoped." One step more—the confusion of the line of slope-shading with those of hill-outline—and the pictures would be conventionalized, all signs of origin would be lost, and students who had never seen a great mountain-range would be led to think of it as a wall-like ridge. Even "ant-hills" are preferable to the "caterpillar" in its crudest form.

An indication of the importance attached to the new problem of relief is to be seen in the fact that, before the method of hill-shading or hatching had been perfected, the method of horizontal contouring had already been invented. In 1737 Philip Buache, a French geographer of remarkably original mind, produced a contoured chart of the English Channel. Contour lines represent what would be coast lines were the sea to rise or fall to the level indicated, and it was natural that this device should first be applied to the mapping of the sea-bed rather than the land. In 1791 Dupain Triel drew a contoured map of France. But already in 1783, as Mr. Ravenstein pointed out in his address at the Cardiff meeting, Lehmann had combined the two systems, and, by superimposing hachures upon contours, and making the depth of shading proportional to the closeness of the contours, had produced a map which, while yielding to the popular requirements, rested on a scientific basis. Contoured maps, in which names are few or absent, can now, however, be made to rival in pictorial suggestiveness those which are shaded, and such maps are the more valuable in that they are not only structurally correct, but that they can be read also with accuracy and ease. Some of the sheets of the American Geographical Survey may be cited as excellent examples of graphic effect produced by contours only.

Ptolemy's knowledge of the theory and methods of cartography far outran the positive materials at his command for the mapping of the known world. In the same way the methods of depicting relief, though so recently developed, already at the end of last century more than sufficed for the presentment of the recorded data. As was seen in the case of Ptolemy, there are peculiar dangers in the possession of an engine more powerful than is needed for the work in hand. In 1783 France was the only country in the world with a completed map based on systematic and detailed surveys. A relief-map like that of Dupain Triel was possible only in such a country. But in 1756 Philip Buache had already launched a general theory of relief resting on the conception of river basins, and had enriched geography with the terms "water-parting" and "plateau." In the absence of popular knowledge, what more natural than that cartographers should make illegitimate use of the theory of Buache, and should assume that in the coherent system of water-partings they had the orographical skeleton of the world? Having drawn the courses of the rivers, they had only to run caterpillar-shading along the water-partings to produce a map, in parts accidentally true, which represented the land as uniformly composed of a series of flat pans. Such a method of map-drawing was advocated by Friedrich Schultz, in a paper published at Wiemar as late as 1803, and is not rare in popular maps of much later date.

It is to Alexander von Humboldt that we owe the method still in use for giving a general, yet real, idea of the relief of a little-known country. Following, as he himself tells us, the precedent of the canal engineers, he constructed vertical sections along his routes through Spain and Mexico. It is worth noting in this connection that our knowledge of the relief of the sea-bed is mainly due to the requirements of another set of engineers—those engaged in laying telegraphic cables. Humboldt's sections were rendered possible by the daily use of the barometer and chronometer, and by Ramond's improvement of the formula for the reduction of barometric data. Before Humboldt, the barometer had been used for the determination of isolated heights, but not for the traversing of a whole country.

Turning now to the other basis of scientific geography—a knowledge of the fluid circulation in the outer envelopes of the earth—we may regard the cornerstone of climatology as laid by George Hadley in 1735, in his well-known paper before the Royal Society, "Concerning the Cause of the General Trade Winds." All that was done before his time was mere digging for the foundations; yet with rare thoroughness he enunciated, at one effort, the final theory, detecting the cause both of the movement equatorwards and of the westward swerving. We can point to no such crucial utterance in the sister field of oceanography, though it is said that, about the time of the American Revolution, Benjamin Franklin suggested that wind-pressure was the cause of the surface-currents of the sea. His idea was contained in a memoir on the Gulf Stream, which was suppressed by him lest it should fall into the hands of the English, and be of use to their ships in crossing the Atlantic. Major Rennell also, who, by his map of India and his Herodotean identifications, presents a likeness to the best of the old school of geographers, showed his participation in the new by compiling an Atlantic current-chart. But Humboldt's invention of isotherms in 1817 first gave to climatology cartographic resources, and rendered easy and precise the correlation of climate with relief. The idea was soon applied in other departments of geography—to the expression of atmospheric pressure, of the temperature of the sea-surface, of density of population, and indeed to any similar masses of data, capable, so far as time is concerned, of reduction to averages, but varying locally. The last edition of Berghaus's Physical Atlas is, in this matter, a monument to the memory of Humboldt; yet it is strange that a method first suggested in the seventeenth century, by the magnetic lines of the Englishman Halley, should have been left to fructify in the mind of a German of the nineteenth century.

The facts of geography are obviously capable of two kinds of treatment. The chapter-headings may be such as "Rivers," "Mountains," "Cities," or such as

"Ireland," "Italy," "Australia." In other words, we may consider the phenomena of a given type in all parts of the globe, or we may discuss in a given part of the globe the phenomena of all types. In the former case, our book should *as a whole* observe the order of what has been called the geographical argument; in the latter case each chapter, the discussion of each country, should exhibit that order complete. For historical reasons, which will be referred to later, we English have fallen into a bad habit of describing the former treatment as "physical geography," and the latter as "geography." The Germans are more reasonable when they contrast *Allgemeine Erdkunde* with *Länderkunde*, but Chorography, our nearest English equivalent to *Länderkunde*, is a clumsy expression. An alternative would be to speak of "special geography," thereby implying a correlative to "general geography," which is a precise rendering of *Allgemeine Erdkunde*. By whatever name we call it, however, it is clear that the treatment by regions is a more thorough test of the logic of the geographical argument than is the treatment by types of phenomena. Hence Humboldt's *Essai politique sur la Nouvelle-Espagne*, published in 1809, must take high rank among the efforts of the new geography as the first complete description of a land with the aid of the modern methods. Here, for the first time, we have an exhaustive attempt to relate casually relief, climate, vegetation, fauna, and the various human activities.

The services of Humboldt to our science were so great that he almost merits the title of a new founder, and yet, of late, it has been the custom to decry him. It is probable that his memory has suffered a little from the less original work of his old age, for the Humboldt who devised cross-sections and isotherms, and wrote the *Essai politique*, was divided by the distance of a whole generation from him who was responsible for the *Asien* and the *Kosmos*.

We come now to the central event in the history of modern geography. It was in the year 1820 that Karl Ritter was called to Berlin to act in the double capacity of Professor in the Military School and Professor Extraordinary in the University. Born in 1779, ten years after Humboldt, Ritter's early training and circumstances were such as admirably to fit him for the great position he was to occupy during the last thirty-nine years of his life. His schooling was at Schnepfenthal, under Salzmann, a well-known educational experimenter of the following of Rousseau. Later in life, Ritter learnt to know and to love the classics, but Salzmann's hostility to them as an educational implement secured for his pupil freedom from the current intellectual moulding. The peculiar opportunities of his subsequent position as tutor in the Hollweg family almost amounted to an endowment for research, and it was then that he accumulated that vast miscellaneous knowledge so valuable to the intellectual pioneer. It is not unimportant in connection with Ritter's later theories to observe that, at this time, Cuvier and Franz Bopp were applying the comparative method to anatomy and philology. Nor did he fail to cultivate that half artistic perception of land-forms, the early exercise of which seems to be to the geographer what youthful training in pronunciation is to the linguist. While travelling with the young Hollwegs, he caused astonishment in Switzerland by the accuracy of his delineation of a mountain range. Add that fortune brought Humboldt and Pestalozzi across his path, and we understand the influences which shaped Karl Ritter into the greatest modern professor of geography.

Ritter produced both books and men. He had the personal charm of the born teacher, and the Prussian officers of 1866 and 1870 were as truly his intellectual offspring as was the *Erdkunde*, of which Schlegel said that it was the Bible of Geography. Nor did his classes fail to bring forth professed geographers, such as Guthe, and historians with the geographical eye, such as Curtius. But Ritter did not stand alone. He was one of a group of four men, who together made the geography of the nineteenth century as distinctively a German science as that of the eighteenth century had been French. One is almost tempted to draw a comparison, man for man, between Humboldt, Ritter, Berghaus, and Perthes, and that great group of later Germans—Bismarck, Moltke, von Roon, and William I. The coincidence is not quite so fortuitous as might at first sight appear; for Berghaus, the cartographer, and Perthes, the capitalist employer of cartographers, were as necessary to the earlier combination as, to the later, were von Roon, the organizer, and William, the kingly employer of statesmen and generals.

In 1827 Humboldt, who, on his mother's side, was French by descent, left Paris, which had been his home for nearly twenty years, to join the Prussian Court at Berlin. In the winter of 1827–28 he gave a course of brilliant lectures before the University, in which was contained the nucleus of the subsequent *Kosmos.* In 1829, at the invitation of the Russian Government, he spent twenty-five weeks on a rapid journey to the mines of the Ural and Altai, and received the impressions which led to the *Asien.* Thence onward Humboldt and Ritter lived at Berlin, mutually appreciative, and complementing each other in mental characteristics. They died in the same year, 1859, just before those great political events which changed the whole aspect of German life.

The influence of the new school was early felt beyond Germany. Petermann, the pupil of Berghaus, came to our islands to help Keith Johnstone with the English edition of Berghaus's great Physical Atlas, whilst Arnold Guyot, the Swiss disciple of Ritter, after teaching for a time at Neuchâtel, crossed the Atlantic to lecture at Harvard, and afterwards to accept a chair at Princeton.

No sooner, however, were the two great masters at Berlin dead, than German geography passed into a new phase, a phase of which the typical representative was Oscar Peschel, the critic of both Humboldt and Ritter. The facts of Peschel's life are soon told. He began as a journalist, he became a geographical writer, and died a professor of geography. From 1849 to 1854 he was assistant editor of the Augsburg *Allgemeine Zeitung.* Then until 1870 he was sole editor of the weekly *Ausland.* From 1871 until his death in 1875 he occupied a chair in Leipzig University. The titles of his books may serve as an index to his mind. The 'Age of the Discoveries' appeared in 1858, and the 'History of Geography' in 1865. He then turned his attention to physical questions, and produced in 1870 his striking 'New Problems for Comparative Geography.' Finally, in 1874, came the *Völkerkunde*, a title not easily translatable into English. After his death his pupils, acting apparently under the inspiration of Professor Kirchhoff of Halle, collected his essays and lectures, which were published in a series of volumes edited with varying degrees of merit.

Peschel's criticism of Humboldt was of the rarest kind. He appreciated the good, detected the errors, and, above all, suggested the remedies. Humboldt's later works, the *Asien* and the *Kosmos*, both exhibit striking excellencies, and for a time enjoyed great vogue, yet both, like Newton's Optics, helped to delay the advance of science. How this happened will be manifest if we reflect that general or physical geography is the basis, not only of special geography, but also of geology; and that just when Humboldt was vitiating his description of Asia with Elie de Beaumont's speculations on the origin of mountains, and was conveying the impression that general geography was equivalent to the entirety of natural science, Lyell was shaping physical geography to the ends of the geologist, and making it a key to unlock the past. The result, so far as geography is concerned, may be seen at the present day in the time-table of many an English girl's school. Separate hours are set apart for "physical geography" and for "geography." The one is studied with a text-book written from the geological standpoint, the other in a manual of mere names, lit up occasionally with a few ideas drawn from Ritter or Strabo. Thus it was that geography was divorced from physical geography to be unequally yoked with history. Peschel restored physical geography to the geographer, and made it the implement of analysis in the field of *Länderkunde.*

But while the geographers had gone astray in the wake of Humboldt, the geologists neglected that great chapter of their subject which they hold to-day in common with the geographers. Stratigraphy, palæontology, and mineralogy claimed their first attention, and it was only after a time that Ramsay and Geikie among the English geologists, and Dana among the Americans, began to study what we now call geomorphology—the causal description of the earth's present relief. It was Peschel who asserted the claim of geography to include geomorphology, and so rendered possible a genetic, as opposed to a merely conventional classification of the features of relief. Though common to both studies, it plays a different part in each. The geologist looks at the present that he may interpret the past; the geographer looks at the past that he may interpret the present. The geographer's argument begins, as we have said, with the surface of the earth, but of his almost artistic perception of land-forms he must add a causal analysis; precisely as the artist learns anatomy the better to grasp the human outlines.

Peschel's criticism of Ritter is less happy than that which he gave to Humboldt. He complains of Ritter's use of the expression "comparative geography," and substitutes another of his own. As a matter of fact, all geography which is not merely descriptive must be comparative, and the various uses of the term made by different writers are but particular cases of one of the most general ideas in scientific method. Varenius called all geography comparative that was not mathematical or astronomical. Ritter compared peoples with the lands they inhabited, in order to establish the influence of environment. Peschel compared one physical feature with another, with the object of discovering their origin. Markham uses comparative geography to imply a comparison of historical records, with a view to showing the changing aspects of the same locality at different times. Peschel's difference with Ritter is, in this matter, a merely verbal quibble. Nor can we say much more with reference to his obvious dislike of Ritter's teleological views, which, though they colour every statement he makes, yet do not affect the essence; it is easy to re-state each proposition in the most modern evolutionary terms. Where, however, Peschel questions the adequacy of particular correlations of peoples and environments, it must be admitted that he usually strikes between the joints, and this is still more evident when he has to deal with Ritter's daring follower, Buckle. The truth of the matter is that Ritter and Buckle had taken for their field the highest and most difficult chapter in geography, and that they underrated the complexity of the problems with which they had to deal. We are all familiar with the saying that it required the Greeks in Greece to develop the Athenian civilization, and that neither the Greeks elsewhere, nor any other race in Greece, would have been equal to the achievement. It would be easy for a Peschel to demonstrate the falsity of an assertion that the Greeks owed all to Greece, but, on the other hand, the Ritters and Buckles were in error in attempting so simple an explanation. What seems to have been constantly omitted from these speculations is the fact that communities can move from one environment to another; that even a given environment alters from generation to generation; and that an existing community is often the product of two or more communities in past generations, each of them subject to a different environment. Now, the influences affecting a community at a given time may be resolved into dynamic and genetic. Among the dynamic influences, geographical environment is admittedly important.

But the genetic influences are the momentum from the past, and the genetic influences acting on this generation may be resolved into the dynamic and genetic of the last. If this process be repeated through many generations, it is clear that the sum total of geographical influence is always accumulating. The Normans, for instance, were exposed to successive environments in Norway and in Normandy, and much that was out of place in Normandy was due to the earlier action of Norway. The American, again, has characteristics and institutions which could hardly have been cradled in the Mississippi plain, but are explainable by a reference to the peninsulas and islands of Europe. A very striking instance of the errors involved both in Ritter's methods and Peschel's criticism is to be found in the case of China. Peschel assumes that the Chinese civilization grew up in China, and asserts that a land of so massive outline was not fitted to stimulate such a growth. But the most modern research tends to show that the Chinese were not thus isolated in early times, and that Chinese civilization was of Western, not home origin. Ritter erred in thinking the action simple and uniform, Peschel in underestimating its cumulative influence.

Since the war of 1870, geographical chairs have been multiplied throughout Europe, and especially in Germany, and at the present time German-speaking geographers form a little public of themselves. Some of the professors, as von Richthofen of Berlin, and Penck of Vienna, have worked mainly at geomorphology; others, such as Krümmel of Kiel, at oceanography; others, again, such as Ratzel of Leipzig, at anthropogeography; while Wagner of Göttingen has been conspicuous in cartography, and Kirchhoff of Halle, and Lehmann of Münster, in questions of method. Davis of Harvard, and Woeikof of St. Petersburg, may count as foreign adherents of the German school. There can be no doubt that it is especially in geomorphology that the advance has been most rapid, and here we may trace Peschel's impulse still unexhausted. In 1887 Gerland of Strasburg went so far as wholly to exclude the human element from geography, and to make it a purely physical science. He probably represents the extreme swing of the pendulum. There is evidence now of a reaction towards Ritter, and, as Wagner has pointed out, we owe to Gerland himself the admirable series of maps in the new edition of Berghaus's Atlas, which deals with man, and brings out with startling clearness the interdependence of relief, climate, and population.

Let us now sum up the problems and methods of modern geography as they have resulted from the last five generations of work and criticism. Merely verbal definitions may be left to the dialectician, but there are two different modes of giving practical definition to a department of knowledge. It may be considered either as a discipline, or as a field of research. As a discipline, a subject requires rough definition for the purposes of organization. It should exhibit a central idea or a consistent chain of argument. On the other hand, no theoretical considerations can hold the investigator within set bounds, though he is none the less practically limited by the nature of the arts of investigation to which he has served his apprenticeship. The chemist should manipulate the blowpipe, the physicist should be an expert mathematician, the historian should be skilful as a palæographer, and familiar with mediæval Latin. That subject is most legitimate which admits of either definition, which exhibits both a consistent argument and also characteristic arts. The researcher will then be the writer of the text-book, and while research is fertilized by suggestions born of teaching, teaching will be illuminated by the certainty within uncertainty which comes of first hand touch with facts. Geography satisfies both requirements; it has arts and an argument.

There are three correlated arts (all concerned chiefly with maps) which may be said to characterize geography — observation, cartography, and teaching. The observer obtains the material for the maps, which are constructed by the cartographer and interpreted by the teacher. It is almost needless to say that the map is here thought of as a subtle instrument of expression applicable to many orders of facts, and not the mere depository of names which still does duty in some of the most costly English atlases. Speaking generally, and apart from exceptions, we have had in England good observers, poor cartographers, and teachers perhaps a shade worse than cartographers. As a result, no small part of the raw material of geography is English, while the expression and interpretation are German.

The geographical argument has already been sketched. The first chapter deals with geomorphology—the half-artistic, half-genetic consideration of the form of the lithosphere. The second chapter might be entitled geophysiology; it postulates a knowledge of geomorphology, and may be divided into two sections—oceanography and climatology. At the head of the third and last chapter, is the word "biogeography," the geography of organic communities and their environments. It has three sections—phytogeography, or the geography of plants; zoogeography, or the geography of animals; and anthropogeography, or the geography of men. This chapter postulates all that has preceded, and within the chapter itself each later section presupposes whatever has gone before. To each later section and chapter there is an appendix, dealing with the reaction of the newly introduced element on the elements which have been considered earlier. Finally, there is a supplement to the whole volume, devoted to the history of geography, or the development of geographical concepts and nomenclature.

The anthropogeographer is in some sense the most typical and complete of geographers. His special department requires a knowledge of all the other departments. He must study geomorphology without becoming a geologist, geophysiology without becoming a physicist, biogeography without becoming a biologist. It has been recognized ever since the time of Strabo that geography culminates in the human element, but the difficulties in the way of precise thought in this branch of the subject are such that, while its claims have been constantly reasserted, the other branches have hitherto made greater progress. At all times each race exhibits a great variety of initiative, the product, in the main, of its past history. In each age certain elements of this initiative are selected for success, chiefly by geographical conditions. Sometimes human genius seems to set geographical limitations at defiance, and to introduce an incalculable element into every problem of anthropogeography. Yet, as we extend our survey over wider periods, the significance even of the most vigorous initiative is seen to diminish. Temporary effects contrary to nature may be within human possibilities, but in the long run nature reasserts her supremacy. Celt, Roman, and Teuton successively neglected the Alpine and Pyrenean frontiers, but modern history has vindicated their power. Probably, when it is fully recognized that the methods of anthropogeography are essentially the same as those of physical geography, advance will become more rapid. The facts of human geography, like those of all other geography, are the resultant for the moment of the conflict of two elements, the dynamic and the genetic. Geographical advantages of past times permitted a distribution and a movement of men which, by inertia, still tend to maintain themselves even in the face of new geographical disadvantages. Economic or commercial geography should probably be regarded as the basal division of the treatment. The streams of commodities over the face of the earth, considered as an element in human environments, present many analogies to the currents of the ocean or the winds of the air. Strategical opportunities, also, have a constant action on communities, in the shape of tempting or threatening possibilities. Political geography becomes reasonable when the facts are regarded as the resultant in large measure, of genetic or historical elements, and of such dynamic elements as the economic and strategic.

This being our conception of geography, it seems not without interest to sketch our ideal geographer. He is a man of trained imagination, more especially with the power of visualizing forms and movements in space of three dimensions—a power difficult of attainment, if we are to judge by the frequent use of telluria and models. He has an artistic appreciation of land forms, obtained, most probably, by pencil study in the field; he is able to depict such forms on the map, and to read them when depicted by others, as a musician can hear music when his eyes read a silent score; he can visualize the play and the conflict of the fluids over and around the solid forms; he can analyze an environment, the local resultant of world-wide systems; he can picture the movements of communities driven by their past history, stopped and diverted by the solid forms, conditioned in a thousand ways by the fluid circulations, acting and reacting on the communities around; he can even visualize the movement of ideas and of words as they are carried along the lines of least resistance. In his cartographic art he possesses an instrument of thought of no mean power. It may or may not be that we can think without words, but certain it is that maps can save the mind an infinitude of words. A map may convey at one glance a whole series of generalizations, and the comparison of two or more maps of the same region, showing severally rainfall, soil, relief, density of population, and other such data, will not only bring out causal relations, but also reveal errors of record; for maps may be both suggestive and critical. With his visualizing imagination and his facile hand, our ideal geographer is well equipped, whether he devote himself to a branch of geography or to other fields of energy. As a cartographer he would produce scholarly and graphic maps; as a teacher he would make maps speak; as an historian or biologist he would insist on the independent study of environment instead of accepting the mere *obiter dicta* of the introductory chapters of histories and text-books; and as a merchant, soldier, or politician he would exhibit trained grasp and initiative when dealing with practical space-problems on the earth's surface. There are many Englishmen who possess naturally these or compensating powers, but England would be richer if more of such men, and others besides, had a real geographical training.

Let us consider for a moment the methods of organization by which the German results have been produced. There are two systems of examination important to geography—the philosophical doctorate of the universities, and the *facultas docendi* of the State. Candidates for the doctorate present three subjects, one major and two minor, selected according to the taste or requirements of the student. Young geographers usually present themselves in geography as major, and in history and geology as minor subjects. The State examination for the *facultas docendi* is of greater severity and of more general effect, in that every secondary teacher must hold the government qualification in the subjects he teaches. As long ago as the time of Mr. Keltie's report, a single professor, Wagner of Göttingen, had examined in geography 200 candidates for the *facultas docendi*. It is a consequence of this system that at the last meeting of the *Deutsche Geographentag* there was an attendance of 500 members, *mostly specialist teachers of geography*; and, as a further consequence, there is a market for good maps in the German-speaking lands, whereas in England, reformers are constantly daunted by the fact that the public actually *prefers* the bad to the good. English specialists are almost invariably compelled to use German maps.

In most German universities there is now a geographical institute, possessed of lecture-rooms and work-rooms, with appliances and collections; and the teaching combines lecture, seminar, cartographical exercise, written thesis, and field practice. At Vienna, for instance, there are two professors of geography in joint charge of an institute founded in 1885. The institute has a yearly subvention from the State, and in 1891 had a library of 2400 volumes, the necessary globes and telluria, and an equipment of instruments for observation and cartography, besides 131 wall-maps, 27 relief models, 135 diagrams, 370 typical views (*characterbilder*), 1200 photographs, 148 bound atlases, and about 5000 separate maps. There were also a collection of rock-specimens, used more especially to convey the necessary geological ideas to the *Historiker* (who form a majority of the students), and a series of typical school-books and school-atlases for the benefit of teachers. Professor Penck remarks that the neighbourhood of Vienna is in itself an admirable laboratory for every department of geography. It should be carefully noted that the university institutes compete neither with geographical societies nor with public libraries, in that books and specimens of rare or unique character are excluded from the collections, which are solely for the use of the students of the institute.

In England geography has no appreciable position in degree-examinations; there are no examinations at all for the post of secondary teacher, nor is there anywhere in the land anything really comparable to the German Geographical Institute. Since 1869 the Royal Geographical Society has made repeated efforts to alter the situation, and it would be an error not to recognize that we are on the upward gradient. The Society's policy has been embodied chiefly in four measures —the offer of medals to the great public schools; the appointment of an inspector to report on foreign geographical teaching; the foundation of lecturerships in the universities, and the institution of a system of training for explorers. After sixteen years of trial the medals were discontinued on the ground that they affected only a few schools, and even in those schools only a few pupils. Out of a total of sixty-two medals awarded, no fewer than thirty fell to two schools; a noteworthy fact, as indicating at once the power and the rarity of skilled and enthusiastic geographical teaching. The most significant result of Mr. Keltie's report, and of the exhibition of specimens collected by him and now deposited with the Teachers' Guild in Gower Street, has been a general improvement in school textbooks and maps, as seen particularly in some of the better elementary schools and training colleges. The university lecturerships have been effective only at Oxford for a sufficient time to judge of results. There, a considerable class of historical students attend lectures in geography twice a week, but are not likely to give the time necessary for more thorough study without the stimulus of examination. None the less, students who have heard lectures are gradually spreading geographical ideas, and the mere existence of the lecturerships is a valuable admission that the study is one of university rank. The classes for explorers have been conspicuously successful, and are probably the best of their kind in the world. But here we are dealing with those arts of observation in which, as already remarked, Englishmen excel.

With the example of Germany before us, with partial success to encourage us, with the interest aroused by the recent Geographical Congress to aid us, and with the reorganization of secondary teaching impending, is not this the ripe opportunity for another, and it may be final effort, to make geography effective in English education? I do not deny that there may be several good roads to success, but I cannot help feeling that our most immediate need is a certain amount of centralization. This is so for two reasons. First, because we English geographers require, above all things, a tradition. We vary so widely in our views, and our examiners examine so differently, that teachers are at a loss whether to keep to the old methods or venture on the new. The old classical education still maintains its supremacy, mainly because through strong tradition it is workable without artificial syllabus; it is an organism rather than a machine. German geography, despite its modern growth, has a tradition, for Germans are all sons in geography of the ancestral group—Humboldt, Ritter, Berhaus, and Perthes. Secondly, we need a worthy object-lesson, which is attainable under existing circumstances only by the concentration of funds, and by the co-operation of several leaders. For no single lecturer, such as the universities at present maintain, can deal adequately with all aspects of geography. An historical or classical student listens to a dozen different teachers at Oxford or Cambridge. Berlin and Vienna have each of them two professors of geography, besides *Docenten*. Moreover, a German student may pass from university to university, and thus correct the limitations of his teachers. Yet nothing short of a considerable object-lesson in England will bring general conviction as to the value and possibilities of geography. Nor need we fear that when centralization has done its work, independent and local initiative will not vary the general tradition. Furthermore, the centralization should not be complete. The work in progress at the universities must not be abandoned. It will steadily gain importance in proportion as the central body does the work for which it is designed.

Clearly, if the policy of centralization be agreed to, there is only one site for the central school. It must be in London, under the immediate inspiration of that Royal Geographical Society, whose past services to the cause would be a guarantee of support during the early efforts. But geographers must associate with themselves experts in education, if they are to avoid certain rocks which have knocked many a hole into the geographical projects of the past, and if public bodies and private individuals are to be moved to financial generosity. The beginning might be on a relatively small scale, but must not be too small for completeness. Theory, both on the scientific and historical sides, must be represented, and each of the three geographical arts. As regards observation, nothing better could be asked than association with the admirable classes already existing. Cartography would be needed not only to supply the English map trade with an occasional Petermann, but especially that all serious students of the school might learn the ways of the geographical workshop. Teaching would naturally be associated with the various secondary and elementary training colleges. A certain number of university men might be tempted by the offer of a diploma to interpose a geographical year between the university and the master's desk; for head masters would probably be only too glad to give the teaching of geography into the hands of specialists, provided these were men of university culture, able to be of general service in school-work, and provided also there was adequate guarantee that they were experts. There would, in addition, be a system of evening classes for teachers and clerks, and thus, while the school would render obvious and direct service to six millions of people, the staff would gain strength from the sense of a generally diffused trust in them. The school would in no way duplicate the Geographical Society, while its staff would contribute an element of trained experts to the newly established afternoon meetings.

I launch this scheme, not with any fixed idea on the subject, for I would willingly abandon it in favour of another shown to be better, but because I am convinced that now is a great opportunity, and that a definite plan, even if it should prove unworkable, is more likely to provoke discussion and to produce result than mere negative criticism, which has often been anticipated. As effects of any adequate scheme, I should hope that, in a few years' time, geographical examinations would consistently test not merely memory for small detail, but clearness of apprehension, breadth of view, and power of statement, whether in word or map; that teachers would have the knowledge needed for socratic rather than dogmatic teaching, and that students of geography would exercise the powers of analysis and composition, and not merely observe and remember. Geography would then be a subject rather for the higher than the lower parts of schools, and with the aid of a shelf of the classics of travel, sixth-form boys would write geographical essays with rapid but accurate map illustration. Then, the universities would receive freshmen who, whether candidates for historical or scientific honours, could express themselves resourcefully in map and diagram, as well as in language and writing. I speak from experience when I say that not one undergraduate in thirty has the necessary equipment for accurate appreciation of space-relations in history, as well as time-relations. In an age of inevitable but unfortunate specialization the organizing of another correlating study should not be unwelcome.

Once more, let us emphasize the fact that geography is not the science of all things. It has been the aim of this address to bring out the specific character of geography and of the geographer. Nor is it the only important subject in education. Its devotees frequently do it harm by excessive claims. Moreover, let us admit that as geography is now too often taught, and even as it is conceived of in some circles which pass for geographical, it merits no greater mercy than it receives at the hands of educationalists. Nor let it be denied that some facts that we would see taught as geographical are already dealt with in other, and, as we think, less advantageous connections. Lastly, let us beware of extolling the German example, which happens to be good in geography, to the degree of imputing inferiority to the whole system of English education. Let us do full justice to the position of our opponents, let us humbly benefit by their criticism, and then claim soberly, but with persistence, that a worthy geography is no pariah among intellectual disciplines. Amid the changes of organization which are imminent, let us steadily maintain that the geographical is a distinct standpoint from which to view, to analyze, and to group the facts of existence, and as such entitled to rank with the theological or philosophical, the linguistic, the mathematical, the physical, and the historical standpoints. No intellectual education is complete which does not offer some real insight from each of these positions.

THE MONTHLY RECORD.

THE SOCIETY.

The New Library Catalogue.—The library of the Society is in many respects the most complete geographical library in the world. The number of books, pamphlets, and periodicals contained in it has been steadily growing for the last sixty years, and, until the extension of library space a year ago, the size of the collection was a hindrance to its convenient use. The only catalogue available consisted of the volume published in 1865, with two printed supplements, issued in 1871 and 1882, and a mass of manuscript slips arranged alphabetically, containing most of the accessions down to date. Many books and a large number of pamphlets were not catalogued at all, and the numerous series of periodicals were in a state of some confusion on account of want of space for proper arrangement. The practical inconvenience of this state of matters led the Council to decide that the catalogue should be reprinted as a single volume, incorporating all the supplements, and brought down to the close of 1893. At the same time, a work of much greater magnitude was decided upon—the preparation of a subject-catalogue of the entire library, which would form in a sense a bibliography of geography, and this is now in progress. The new catalogue was finished early in the present year, and is now ready for distribution as a royal octavo volume of nearly 840 pages. It is, fundamentally, a list of works arranged alphabetically under the authors' names. There is, however, a considerable amount of geographical literature which cannot be classed in this way, but must be placed in some geographical order. In the earlier catalogue and supplements, titles of the latter class were given in the same alphabet with authors' name, thus giving rise to some confusion. In the new catalogue this material is arranged in three appendices, on a plan which it is hoped will be found practically convenient. The author's catalogue occupies 521 pages, printed in double columns, with the names in heavy type to catch the eye. It includes 18,000 entries, of which 9400 are the titles of books in one or more volumes, 4800 the titles of pamphlets or reprints, and 3800 are cross-references to works by joint authors, or to papers catalogued in the appendices. Books are distinguished from pamphlets by the manner of indicating their size, an octavo book being shown by "8°" after the title, and an octavo pamphlet or reprint by "8*." In addition to the names of authors, this section includes the names of ships whose voyages have become geographical classics, and also the names of early travellers, and the subjects of biographical notices, with references to the authors treating of them. The place and date of publication are always given. All titles are given in the language in which they appear on the book, except in the case of Russian works, when it seemed better to translate into English, and add the words "[In Russian]." Appendix I. gives a list of collections of Voyages and Travels arranged alphabetically under authors' names as far as possible, and, in the case of anonymous collections, in the order of date of publication. An analysis is given of the contents of each volume, the whole occupying 88 pages, and including about 3300 entries. Appendix II. is an attempt to classify the official and anonymous works other than periodicals. It is arranged geographically, the continents being placed in alphabetical order, and divided into countries, also arranged alphabetically, with such subdivisions and minor subdivisions as were necessary in each case. After the continents come the main heads, *Oceans*, *Polar Regions*, and *General*. This section extends to 149 pages, with about 5600 separate entries. Appendix III. is a complete list of the periodical publications in the possession of the Society, also arranged in geographical order according to place of publication. Under each country the towns where the works are published are given alphabetically, all the periodicals in each town being thus placed together. The serials in the library were put in order by Dr. Murie as a preliminary to the preparation of the Subject Catalogue, and he has written and verified the third Appendix. It occupies 61 pages, and contains about 1600 entries, which are printed in single column. From a rough estimate, the total number of volumes in the library appears to be about 50,000; the exact number will be known when the press-marking of the books now being carried on is completed. The new catalogue will, it is hoped, greatly facilitate the use of the library by Fellows. It has been compiled by the librarian, Dr. H. R. Mill, assisted by Mr. Vincent Hawkins and Mr. Heawood, and the proofs of a large part of the work were also read by Colonel Dalton and Mr. Ravenstein. The volume may be obtained by Fellows for a nominal payment on application at the office of the Society, and by non-fellows, either at the office or through a bookseller, Mr. Murray being the publisher.

Legacy to the Society.—The late Mr. James Jackson, honorary corresponding member of the R.G.S., and formerly "Archiviste-Bibliothecaire" of the Paris Geographical Society, has left a sum of 100,000 francs, to be divided equally among nine Geographical Societies, including our own. The Society's share, after deducting duty, will amount to about £400.

Educational Lectures.—Under the joint auspices of the Royal Geographical Society and the London University Extension, Mr. H. J. Mackinder will give a course of twenty lectures, on the Principles of Geography, with illustrations from the Atlantic and Britain, at Gresham College, Basinghall Street, E.C., on successive Monday evenings, at 6 p.m., beginning on October 7. To these the Fellows of the Society are admitted free. The subjects of the first ten lectures will be as follows: (1) The Geographical Co-ordinates; (2) the Continental Shelf; (3) the Establishment of the Port; (4) the Climatic Zones; (5) the Continents and the Seasons; (6) the Gulf Stream; (7) the East Greenland Current; (8) Types and Conditions of Vegetation; (9) the Climate of Britain; (10) the British Fauna and Flora. Each lecture will be followed by a class for more detailed study, and the course will be illustrated with diagrams. The subjects of the second ten lectures, to be given after Christmas, will be the following: (11) the Relief of South-Eastern Britain; (12) the Structure of South-Eastern Britain; (13) the Drainage of South-Eastern Britain; (14) South-Eastern Britain before Man; (15) the Successive Entries of Man to South-Eastern Britain — Natural Frontiers; (16) the Metropolis; (17) Roads and Minor Settlements; (18) Territorial Organization; (19) the Part of London in British History; (20) the Part of Britain in the World's History. In Lectures 19 and 20 the subject will be considered from a geographical standpoint.

EUROPE.

Dr. Grossmann's Journey in Iceland.—Dr. K. Grossmann writes to us as follows from Hvitarvatn, Iceland, under date August 18, 1895: "I am writing from the midst of a perfectly untrodden district, where I am camping with my friend Dr. Cahnheim, and shall give this card to the first human being we meet, to post it somewhere. Although not favoured by good weather, having had to contend with the moist tiresome fogs and north winds, we have been able to see some districts hardly ever visited by any one before. It had been just possible to have a look into the mysterious Thorisdalur from the top of the Geitlands jökull, when a snowstorm drove us back into less haunted regions. On a visit to Surtshellir and its fascinating ice-cave a disappointment awaited us, inasmuch as, owing to the warm weather in the early part of the year, the ice-crystals had disappeared completely, and only ice-stalactites remained. One of the most enchanting spots is 'Hveravellir,' a region of hot springs *à la* geysir; the sinter deposits are of exquisite beauty and regularity, and the splendour of the colour of the main spring, with its opalescent turquoise blue, and its yellow rim of brimstone, cannot be easily described in words. *À propos* of the geysir, we did succeed in making him go off, by a dose of physic, about which more when I return. Of all the interesting parts seen, the one which impressed me most is Hvitarvatn, especially as we came from the north. The enormous glaciers descend into the lake on the north and west, and break off with a perpendicular wall of bluish-green ice, some 60 to 100 feet high. The northern part of the lake is filled with huge icebergs, some rising 40 feet and more out of the opaque water; large colonies of swans, two or three islets—a truly arctic picture. The big map of Gunnlaugsen completely fails in this district, as in every other part of the interior. There is a vast field here for geographical research, but our limited time and our few instruments are not compatible with any work in this direction."

Karst Studies.—Dr. Kurt Hassert, of Leipzig, well known for his journeys and researches in Montenegro, is now in Italy for the purpose of thoroughly investigating the Karst phenomena (hitherto little studied) in the Apennines, especially in Abruzzo, while at the same time Dr. Robert Sieger of Vienna is systematically following out, under the auspices of the German and Austrian Alpine Club, his interesting researches into the Karst-forms of the glaciers of the Austrian Alps, with special reference to the causes of their origin. Amongst other results, he hopes in particular to help towards a solution of the problem of the peculiarly shaped hillocks known as *drumlins*, which are a general characteristic of such places as were long the site of the ends of glaciers during the Ice-age, as was observed first by Dr. Sieger himself on the Lake of Constance, and subsequently also by Nansen in Greenland, by Baron Toll in the New Siberian islands, as well as in Finland, Sweden, and North Germany. It is not impossible that these forms may be explained as deposits of detritus in ice-chimneys, light-holes, or similar glacial features resembling those of the Karst.

Meteorological Station on the Brocken.—The agitation, which has been set on foot by certain sections of the German and Austrian Alpine club, for the erection of a meteorological station of the first rank on the Brocken (3740 feet), has at last been crowned with success, the state government of the Duchy of Brunswick having granted a subsidy of 1500 marks towards the expense. The station will, it is said, be built within the present year. A visitor to the Brocken in August, however, informs us that there was no sign of such a building being erected, the meteorological instruments exposed on the summit being those of an ordinary observing-station, and the screens protecting them had evidently been unpainted for a considerable time.

Census in Bosnia.—Ten years having elapsed since the first census in the Austro-Hungarian occupied provinces, a second numbering was carried out therein on April 22 of the present year. The preliminary results of the same have just been published by the statistical department of the government for Bosnia and

Herzegovina. According to these, the country, with an area of 19,730 square miles (51,110 square kilometres), has a total population of 1,565,359 souls, and therefore shows for the single decade the comparatively large increase of 17·2 per cent., the density having in the same period increased from 66 to 79 inhabitants to the square mile. Bosnia will, therefore, be now more thickly peopled than the Austrian Crownlands, Salzburg (61 to the square mile), and Tyrol (76 to the square mile), and about as thickly as the central and south-west parts of Wales or the interior of Scotland. The increase in the number of dwelling-houses is 48,000, or 22·3 per cent. The greatest increase is in the towns, the most noteworthy being as follows:—

Sarajevo, the capital,	increase from	26,300 to 37,700 (43·6 per cent.).
Dolnja Tuzla	„	7,200 to 10,200 (42·1 per cent.).
Banjaluka	„	11,300 to 13,700 (19·3 per cent.).
Mostar	„	12,600 to 14,400 (13·5 per cent.).

The final results are expected to be published about the end of the present year.

The Population of Vienna in Relation to its Place of Origin.—The working up of the copious material relating to the last census of Austria-Hungary (December 1, 1890), which has been gradually carried out by the Statistical Central Commission, has lately supplied the following interesting results in reference to the place of origin of the population of the capital. Of the 1,364,548 inhabitants which Vienna proved to possess on the day of numeration, 754,486, or 55·3 per cent. of the whole (*i.e.* considerably over half), were born outside the city. An analysis shows that of every thousand persons settled within its limits there were born in Vienna, 447; in the surrounding districts, 19; in the Crownland Lower Austria, 95; in other parts of the monarchy, 338; in foreign countries, 101. The influx takes place in particular from the north-west and north of the monarchy, the only parts in these directions where its strength appears to be reduced being the neighbourhoods of the large towns of Northern Austria, of Prague (population 360,000) and Brünn (110,000), in consequence of the attraction exercised by these. In a southerly direction the force of attraction of Vienna rapidly diminishes. The cause of this is to be found in the more stationary character of the population of the Alps as opposed to that of the Sudetian provinces, to which may be added the fact that here in the south the district of the Styrian forest industry, as well as the Styrian capital, Gratz (with a population of 122,000), and quite in the south Triest (145,000), completely overpower the already weakened attraction of Vienna by their own. An influx from the east is practically wanting, owing to nearness of the Hungarian border with Budapest (500,000 inhabitants) on the further side as a centre of gravitation of population; whilst the districts to the west, which lie on the Danube, the old main line of communication towards the east, are characterized by a comparatively large migration towards the capital. The influx of population towards Vienna, as the focus of Austrian trade, commerce, and industry, far surpasses that to any other of the large towns of Austria.

ASIA.

The Trade of Newchwang in 1894.—From the report of Mr. Consul Hosie (Foreign Office, Annual Series No. 1613), it appears that, allowance being made for the effect of the Japano-Chinese war and other causes tending to a decrease, the trade of the port of Newchwang during the year 1894 was on the whole satisfactory. The decrease under the three divisions, foreign imports, native imports, and exports, may be accounted for almost entirely by a falling off in the three articles Indian yarn, raw cotton, and ginseng respectively, while the amount of the gold decrease shown in the tables is exaggerated by the fall in exchange. A temporary cause of decline in the exports was the destruction of crops by floods west of the Liao river. The trade in Indian opium, once the most valuable of foreign imports, is rapidly disappearing; not that the number of smokers has decreased, but owing to the cultivation of the native drug. Indian yarn, however, now takes the first place in the list of imports at the expense of that from England, and its decrease during 1894 was due solely to the war. The number of British steamers entering the port, which fell from 171 to 158 in 1893, fell further to 144 in 1894, while an increase of 25 in the number of German steamers during the two years is recorded. As regards the future, the outlook is considered by Mr. Hosie to be gloomy in the extreme.

AFRICA.

Prince Ruspoli's Journey in the Galla Countries.—At a meeting of the Italian Geographical Society held in commemoration of Prince Eugenio Ruspoli, Prof. Elia Millosevich gave a detailed account of the prince's journey in the Somal and Galla countries, based on the papers brought home by his companions after his tragic death ('Memorie Soc. Geogr. Ital.,' vol. v. parte 1). The following details, relating to the later stages of the expedition, supplement the previous accounts (*Journal*, vol. iii. p. 137). The final start having been made up the course of the Daua—a right-bank tributary of the Jub—the stream was followed, with some deviations, along its southern bank, until a little after the junction of the two upper branches, the confluence of which had been visited by Captain Grixoni, the more southern being ascended for a short distance by the prince. The route then led to the south-west, and a difficult mountainous district was entered, a considerable altitude above the sea being reached. North of this the expedition arrived at the country of Giam Giam, and, the march being continued to the south-west, the Ambara-Burgi (an agricultural race, apparently of Semitic origin) were visited, and friendly relations established with their sultan. Leaving the caravan encamped at Coromma in his district, the prince proceeded in his company to the Omo, here known as the Sagan, across a plain abounding in game. On the further side of the stream, which where crossed was over 100 yards wide, deep, and full of crocodiles, the Lake of Abbaja was discovered. It has no connection with the Omo, but is surrounded by mountains, and measures roughly 20 miles by 10. The Omo passes east and south-east of the lake, and is said to take finally a decided southerly direction. According to the map given with the report, the spot where the stream was crossed lies about 105 miles north-east by east of the northern end of Lake Rudolf. A renewed start westwards having been made by the united caravan, the tragic death of the leader (December 4, 1893) soon followed, and his companions made their way back through the country of the Borani Galla, and proceeding *viâ* Lugh or Logh, reached the coast at Brava on March 11, 1894. Besides the notes and surveys of the prince, an important botanical collection was also brought home in safety.

Mr. Cowper's Journey in Tripoli.—At the Ipswich meeting of the British Association, Mr. H. S. Cowper gave an account of his recent journey in Tarhuna and Gharian, in Tripoli. This short excursion was made with the express purpose of investigating a series of megalithic ruins, which were known to exist, but of which nothing has been hitherto known, except brief notices on one or two sites mentioned in the writings of the travellers Barth and Von Bary. Mr. Cowper travelled first south-west, and entered the Tarhuna district by the Wadi Doga, which appears never to have been entered previously by an English traveller. The Wadi Doga is a fine valley about 800 feet above sea-level, surrounded by hills about 800 feet higher, and contains numerous ancient sites of megalithic temples, some in a fair state of preservation. Thence he passed by Kasr Doga, a magnificent

Roman monument described by Barth, on to the Tarhuna plateau, a grassy and partly cultivated plain, 25 miles from east to west, and of unascertained width. Here the remains were even more numerous than in Wadi Doga, there being hardly a hillock on the summit of which the remains of one of these megalithic temples could not be found. Mr. Cowper camped on this plain with the family of his guide, and was throughout treated with hospitality by the Tarhuni Arabs. These people are pastoral Arabs of pure race, rigid Mussulmans, but apparently not fanatically inclined towards Christians. They live in rows of tents during the winter, and in wattle huts among their crops during summer. Some of them inhabit underground chambers dug in the soil below the level of the ground. Leaving the Tarhuna plateau, he rode north-east, and, crossing the Wadi Daun (which with two smaller wadis which join it is full of Roman ruins, and crossed at frequent intervals by Roman dams), he reached the foot of Jebel Msid, lying at the east end of a wide and beautiful valley called Kseia. Having examined the ancient sites here, he retraced his steps to the Tarhuna plateau, which he crossed to the south-west, and entered a country of more mountainous character. These hills are partly in Tarhuna and partly in Gharian, and his route was crossed at frequent intervals by important watercourses running north towards the coast. The country, like the Tarhuna plateau, is nearly treeless, and in March very poorly supplied with water. A few crumbling ruins, probably of Roman date, cap the hills, but the megalithic sites are comparatively rare. Houses in Gharian are, as in Tarhuna, unknown, except at the Kasr, where there are Turkish troops. Throughout the district game of any sort is most rare, nothing being seen except quails, partridges, a few hares, and a wild cat. After crossing the Wadis Bir el War and Gethathet Dum, Mr. Cowper arrived at Wadi el Ghan, a southern prolongation of the important Wadi Haera, which leads straight to Tripoli. The scenery down this Wadi is very fine, as it runs between grand cliffs of limestone and sandstone, and at one place there is a fine hill of ferruginous clay. Emerging from the mountains, he passed a curious isolated group of hills lying on the plain like islands, and from this point a two days' journey across the plain brought him to Tripoli.

The Cimatology of Africa.—At the British Association meeting at Ipswich the Fourth Report of a Committee, consisting of Mr. E. G. Ravenstein (Chairman), Mr. Baldwin Latham, Mr. G. J. Symons, Mr. H. N. Dickson, and Dr. H. R. Mill (Secretary), was presented by Mr. Ravenstein, who drew it up. It runs as follows: "Your Committee, in the course of last year, granted a complete set of instruments, including a mercurial barometer presented to them by the Meteorological Council, to the Scottish Missionaries established at Kibwezi, on the road from Mombasa to Machako's. They also supplied Mr. Hobley, now in Uganda, with one of Symons's earth thermometers. Sets of instruments have now been supplied to the following stations: *Bolobo* (Rev. R. Glennie).—Registers up to date have been regularly received since January, 1891. The abstract for the past year has been prepared by Mr. H. N. Dickson. *Lauderdale, Nyasaland* (Mr. J. W. Moir).—An abstract of one year's observations has been sent home through Mr. Scott Elliot. *Zombe, Nyasaland* (Mr. J. Buchanan).—Registers of the observations made from June, 1892, to March, 1894, have been received. The abstract published in the Appendix has been prepared by Mr. Dickson. *Lambarene, Ogowe* (Rev. C. Bonzon).—Only one month's observation has been received. *Kibwezi, British East Africa* (Scottish Mission).—The instruments were only granted this year. One year's rainfall observations have been received. *Warri, Benin* (Captain Gallwey).—The registers have been received up to date. An abstract has been prepared by Mr. Dickson. The sets at all these stations, with the exception of Warri, include a mercurial barometer, four thermometers, and a rain-gauge. That at Warri includes a black-bulb thermometer. Meteorological reports from thirteen stations in British East Africa have been received. These stations lie on or near the coast, between Wasin and the Jub, and along the road connecting Mombasa with Fort Smith in Kikuyu, the climate of which is described as being exceptionally well suited to European residents. These observations were, in most instances, made by officials of the Imperial British East Africa Company. The abstracts have been prepared by the Chairman. Your Committee regret that the instructions laid down for the guidance of observers should, in many instances, have been set aside, and that observations should have been made at hours precluding the possibility of deducing trustworthy means. Where circumstances do not admit of the instruments being read thrice daily—at 7 a.m., 2 p.m., and 9 p.m.—the thermometers should be read at 9 a.m., or twice daily, at an interval of twelve hours. The barometers, however, should be read at intervals of six hours—say at 9 a.m. and at 3 p.m. Your Committee have expended the £5 granted. They beg to propose that they be reappointed, and that a grant be made of £10, which would enable them to establish a station near Lake Ngami." This is followed by tables occupying ten closely printed pages embodying the observations reported. The Committee was reappointed, with the omission of Mr. Baldwin Latham and the substitution of Mr. Dickson as Secretary.

The French in the Bend of the Niger.—By a printer's error, the name of Lieut. Baud, the second in command of Captain Decoeur's expedition to the Niger, was given incorrectly in the September number of the *Journal*. After returning from the Niger, Lieut. Baud was entrusted with a fresh commission to pass to the north of Togoland and the Gold Coast colony, in order to reach the French possessions further west. From a short account of his march, reproduced in the *Mouvement Géographique* (No. 19) from the Paris *Temps*, it does not appear whether the mission has yet been completed. Captain Toutée also (*ante*, p. 185) continued his journey from Bajibo on the Niger, ascending the stream in the hopes of reaching Timbuktu by river. He passed Bussa and Say, and advanced, under much opposition from the Tuaregs, more than 100 miles above the latter place, through a region previously visited by Barth only, but was then forced to retrace his steps without gaining his object.

AMERICA.

Commercial Importance of the Port of Barranquilla, Columbia.—The following details concerning the port of Barranquilla, and its importance to British trade with Columbia, are taken from a recently issued consular report by Mr. Villiers (Miscellaneous Series, No. 374). The physical features of the country, intersected as it is by mountain ranges traversed in great part only by mule-paths, make it inevitable that the chief artery of commerce should be supplied by the river Magdalena, and therefore the ports at or near its mouth are naturally the most important. These are Barranquilla and Cartagena; the former a comparatively new town of 35,000 inhabitants, situated within the mouth of the river, but connected by 18 miles of railway with Sabanilla bay, where the trains run on to the "Great Pier" at Puerto Colombia, and receive the cargoes of ocean steamers direct without the use of lighters. The importance of the port is shown by the fact that two-thirds (by value) of the entire imports of the country enter by it, while its share of the total exports is likewise a preponderating one. Of nine principal lines of steamers trading regularly with Sabanilla bay five are British, while 58 per cent. of the total exports, and about 40 per cent. of the imports, may be assigned to Great Britain. The port of Cartagena, provided with a safe landlocked harbour, has lately been endeavouring to secure for itself a larger proportion of the trade. The old communication with the river by the Dique canal has been superseded by a railroad (opened in October, 1894), which, together with a fleet of river steamers, has the support of capitalists in the United States. This competition does not appear as yet to have interfered with the trade of Barranquilla, which, during the six recent years (1888–93), amounted to nearly four times that of Cartagena. As stated above, the articles of trade passing through the former are mainly British, or intended for Britain, and are conveyed across the ocean mostly in British vessels. The Cartagena route has 67 miles of railway as compared with the 18 of Barranquilla, whilst, in the event of the reopening of a safe channel at the mouth of the Magdalena, the latter would become an actual seaport, so that its position as the principal port of the country seems likely to be maintained in the future. The report contains a series of tables of imports and exports, on which the above conclusions are based.

POLAR REGIONS.

Lieut. Peary's Greenland Expedition.—Telegrams, received from St. John's at the time of going to press, announce the arrival there on September 21, in the steamer *Kite*, of Lieut. Peary and his two companions, the second season's work in Northern Greenland having unfortunately failed to add anything to the discoveries made by the leader during his expedition of 1891–92. It will be remembered that the ill success of last year's attempts to reach Independence bay induced Lieut. Peary to remain in Greenland for another year, with his servant and Mr. Lee, instead of returning with the other members of his expedition in the *Falcon*, which went out last summer for his relief (*Journal*, vol. iv. p. 461). The account just received tells a terrible tale of hardships encountered, mainly owing to the impossibility of finding the *caches* of food made during the previous year, which had been covered over by a snowfall of unprecedented depth. It was only after incredible sufferings that Independence bay was reached, and the absence of food supplies and the enfeebled condition of the men precluded the possibility of further exploration. The start from Bowdoin Lodge was made on April 1, six Eskimo accompanying the party during the first 100 miles, after which the three explorers went on alone. The provisions consisted of raw deer's meat, some tinned biscuit from the single *cache* discovered, with walrus flesh for the dogs, and coal-oil to take the place of alcohol. In the first fortnight 200 miles had been covered, and an altitude of 7000 feet attained, at which height violent winds, with intense cold, were experienced. Numbers of the dogs died, and one of the sledges became useless. Food began to fail, and had not the explorers succeeded in shooting ten musk-oxen shortly before reaching Independence Bay, they could not have saved their lives. The return journey was made, amidst much suffering, in twenty-five days, the outward route having taken forty-three, and the last march of forty-six hours was entirely without food. (For map, see *Journal*, vol. ii. p. 384.) Professor Salisbury, who accompanied the relief expedition in the *Kite*, is said to have done some good scientific work by a study of the geological features of Greenland and the American coast, and by a detailed study of numerous glaciers between 74° 45′ and 77° 45′ N., which brought out especially their marked stratification, their mobility and adaptability to their beds. He has found no evidence of the extension of the Greenland ice-cap towards America. The snow-line, however, is much lower on the American side. Lieut. Peary's work includes the mapping of Whale sound, as well as complete ethnological and meteorological observations.

The Jackson-Harmsworth Arctic Expedition.—Continuing the record we have kept of the progress of this expedition, we have much pleasure in recording that on September 10 the steam-yacht *Windward* arrived safely at Vardo, bringing with her the first news of the expedition which had come to hand for over a year. It appears, from a communication which has been made to us by Mr. Arthur Montefiore, that the *Windward* successfully made the coast of Franz Josef Land on September 7, 1894. Three days later the heavy work of discharging a cargo as valuable as it was various began; and on the 12th the ship was frozen in for the winter. Nevertheless, the difficult task of unloading the stores and equipment was persisted with until everything was safe on shore. It is gratifying to learn that the very complete buildings for the head-quarters depôt were erected—Russian log-houses, folding sheds, observatory, storehouses, kennel, and stable (for the Russian ponies)—and that the exploring-party were able to go into their quarters before the winter set in with unusual severity, even for this latitude. During the winter the most careful preparations were made for the advance in spring, while magnetic, meteorological, and other observations were regularly proceeded with. When the sun returned on February 23, Mr. Jackson and his colleagues prepared to leave their head-quarters and the crew of the *Windward* (who had wintered on board the ship) behind. It may be mentioned that he had kept the whole party in fresh meat throughout the winter, and that as many as sixty Polar bears had fallen to the rifles of the explorers. On March 10 the first advance into the interior was made, all the sledges being heavily laden with provisions and stores, which were to be deposited and securely protected at some convenient locality. Having made the first depôt, they returned for another load, and on this occasion a depôt was made in latitude 81° 20′ N. Returning in May, Mr. Jackson found that scurvy had broken out among the crew, and, in consequence, stayed by the ship until he had got her under weigh on July 3. When she left, he had all his arrangements complete for a third march north, and on this occasion, the snow having become very soft, he was going to utilize the specially constructed boats he had taken with him. The story of the homeward voyage of the *Windward* has been made public in the papers, and it is only necessary on the present occasion to note that she found the ice-pack extremely heavy, and about 300 miles wide from north to south. She occupied sixty-five days in breaking through this formidable belt, and only accomplished it with great difficulty. Three members of the crew have died during the past few months—one from scurvy and two from exposure—but the conduct of all the members of the expedition appears to have been above praise. Those members of the crew, who were so enfeebled with attacks of scurvy as to be almost unable to stand, not only performed their duty without a murmur, but volunteered eagerly for the many difficult and perilous tasks which so readily occur in breaking through any heavy ice. It is especially gratifying to learn that the exploring-party were in excellent health and spirits when the *Windward* left them to come south.

Dr. Nansen's Expedition.—A report has been recently published in the newspapers to the effect that, towards the end of July, a three-masted ship, with a short foremast—a peculiarity which would afford some grounds for its identification with the *Fram*—was seen by the Eskimo off the east coast of Greenland, firmly embedded in drift-ice, on two separate occasions. The localities off which the ship is said to have been seen are Sermiligak and Sermilik, between 65° and 66° N. lat., and the news was forwarded from the Danish trading station of Angmagsalik on the same coast. The fact of a vessel with a short foremast being sighted cannot be accepted as sufficient ground for identification. Any whaler with her foretopmast down would be similar.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Austro-Hungarian Scientific Expedition to the Red Sea.—In continuation of the researches of the *Pola* and *Taurus* in the eastern portion of the Mediterranean, the Aegean, and the Sea of Marmora, the Imperial Academy of

Sciences in Vienna has decided to set on foot a thorough investigation of the Red Sea also, which is to deal with the following points: the relief of the sea-bottom in the parts still unknown in this respect, especially in the Gulf of Akaba; the relations of the currents; the transparency and colour of the water; and especially the chemical and biological conditions of the part of the sea in question. The *Pola* is to leave the harbour of Pola early in October, under the command of Captain P. von Pott, and to reach Jedda, the starting-point for the first campaign, estimated to last seven months, by the end of the month. The scientific members of the expedition are—Hofrath Steindachner, Regierungsrath Luksch, Privatdocent Natterer, and Custosadjunct Liebenrock. Only the northern part of the sea will be examined in the first instance, the southern being reserved for an eventual second expedition, to be despatched in the following year. With respect to the relief of the sea-floor, it will be of special interest to discover whether—as Suess is of opinion—a connecting-link between the great East African depression and that of the Jordan valley and Dead Sea is to be found on the floor of the Red Sea or not; whilst, in the direction of hydrology and physical geography generally, it will be of the highest interest to learn whether Dr. Natterer finds his previous observations on vertical ocean-currents confirmed, and, further, whether here, where the sea is surrounded by land just like a dry hot sponge, he obtains any definite support for his hypothesis of a capillary penetration and impounding of the ocean-water within the continental masses.

GENERAL.

Moritz Willkomm.—On August 26, 1895, Moritz Willkomm, the eminent botanist and geographical explorer, died at Castle Wartenberg, near Niemes, in Northern Bohemia. Born on June 29, 1821, at Herwigsdorf, near Zittau, in the kingdom of Saxony, after 1841 he studied medicine and natural science at Leipzig. In 1844 he for the first time visited the Pyrenean peninsula, which he subsequently traversed so often, sometimes by the year together, making thorough investigations into the botanical, geognostical, and geographical relations of the country. After having, in 1852, gained some experience as teacher of botany at Leipzig, and having been called thence first to Tharandt, and afterwards, in 1868, to Dorpat, he occupied the chair of Botany at the German University at Prague from 1873 until the receipt of his pension in 1892, being at the same time Director of the Botanical Garden in that city. Whilst engaged in teaching in the German University in the Russian Baltic provinces, he gained the title of an Imperial Russian Councillor of State, and during his employment in Austria he was named corresponding member of the Imperial Academy of Sciences in Vienna. Moritz Willkomm did much good work by his rich botanical collections, principally from Spain and the Balearic Isles, as well as by his special botanical works dealing especially with the descriptive side of the science; whilst as a geographer he did lasting service, not only in connection with the geography of plants—in particular in South-West and Central Europe—but also by his comprehensive geographical description of Spain and Portugal; and, above all, he threw light on the geography of Austria by his excellent work on the Böhmerwald (1878), which region he was the first to throw open to science in its most inaccessible parts, still at the time clothed with primeval forest.

Geographical Bibliography in Austria.—On the unanimous recommendation of the Professors of Geography at the Austrian Universities, the Ministry of Public Worship and Instruction has made a grant for the publication of a critical summary for the year of the geographical literature relating to Austria and its provinces. It will appear annually in German (the first volume dealing with 1894), under the title 'Geographischer Jahresbesicht über Oesterreich,' and will contain about ten sheets of letterpress. It will deal with a selection, from a purely geographical point of view, of the regional literature mostly scattered through numerous home and foreign magazines, and by notices, kept strictly to the point, will facilitate the survey of the progress in our geographical knowledge of Austria. The editorship of the new geographical serial, the inauguration of which meets a long-cherished wish, has been entrusted to Dr. Robert Sieger, lecturer in the University of Vienna.

OBITUARY.

James Jackson.

It is with much regret that we record the death, on July 17, in his fifty-second year, of Mr. James Jackson, an honorary corresponding member of our Society. Mr. Jackson was born in France of English parents. For twelve years he filled, gratuitously, the office of "Archiviste-Bibliothecaire" of the Paris Geographical Society. He was a born bibliographer, and during his tenure of office did much to improve the library of the Society. In other respects his services to the Society were of the greatest value. At his own expense he made many additions to the library of the Society. Through his indefatigable efforts, a valuable series of photographic views, numbering about 17,000, was added to the Paris Society's collections, besides 2000 portraits of travellers and geographers. He was himself an excellent photographer, and our own Society possesses many specimens of his work, all of geographical value. Mr. Jackson was the author of a 'Liste Provisoire de Bibliographies Géographiques Speciales,' 'Socotora, Notes Bibliographiques,' and of a useful 'Tableau de Diverses Vitesses.' He was a man of warm and generous heart, ever ready to serve his friends, and to exert himself in the cause of science. In his last will he proved this in a substantial way; he bequeathed the sum of 100,000 francs to be divided equally among nine geographical societies, one of these being our own.

ROYAL GEOGRAPHICAL SOCIETY.

ANNIVERSARY DINNER.

The Anniversary Dinner of the Society was this year held at the Whitehall Rooms, on Tuesday, July 30. This date was selected in order that the dinner might coincide with the meeting of the International Geographical Congress, and thus afford the Society an opportunity of showing hospitality to the many distinguished foreign geographers who would be in England at the time. The company numbered over two hundred and forty, one half of whom were foreign guests. The chair was occupied by the President, Mr. Clements R. Markham, C.B., and among the foreign guests were the United States Ambassador, the Italian Ambassador, the Belgian Minister, the Chargé d'Affaires of Sweden and Norway, the Swiss Chargé d'Affaires, Count Goblet d'Alviella, Captain Amaral, Professor Amrein, Mr. Andrée, General Annenkoff, Professor Anuchin, Colonel Bassot, Count Bizemont, Mr. Borchgrevink, Professor Brückner, Señor Luciano Cordeiro, Professor Cordier, Professor Credner, Hon. Judge Daly, M. de Dèchy, Baron Dhanis, M. L. Drapeyron, M. Marcel Dubois, Mr. Paul du Chaillu, Professor Du Fief, Dr. Forel, Herr L. Friedrichsen, Professor Giglioli, Dr. Gobat, Count Götzen, M. Grandidier, General Greely, Dr. A. Grigorieff, M. Bouquet de la Grye, Colonel Haffner, Count du Pontavice de Heussy, Baron

Hulot, Captain O. Irminger, Dr. Jagor, Professor Kan, Captain Kollm, M. de Lapparent, Professor Levasseur, Dr. Libbey, M. C. Maistre, Don Arturo Marcoartu, Dr. H. Meyer, Senhor Midosi, Dr. O. Neumann, Dr. Neumayer, Mr. Ingvar Neilsen, Mr. O. Nordenskjöld, Dr. Oberhummer, Dr. Baron Max von Oppenheim, Professor Paulitschke, Professor Penck, Señor de Peralta, Count Joachim Pfeil, General Meredith Read, Hon. W. W. Rockhill, Professor Rein, Herr Schönlank, M. Semionoff, Colonel Slatin Pasha, Mr. A. de Smidt, Professor Dr. Von den Steinen, M. C. Struve, Dr. Stübel, Dr. Supan, Professor Vambery, Captain Vasconcellos, Herr C. Vohsen, Professor H. Wagner, General Wauwermans, M. Wijkander, Dr. Wolkenhauer, Colonel Yermoloff, Count Zappelin. Among members of the Society and their guests present were the Earl of Crawford, Lord Kinnaird, Lord Lamington, Sir George Bowen, Sir Rawson W. Rawson, General Sir J. Hills-Johnes, General Sir C. W. Wilson, Sir James Youl, General Sir H. A. Smyth, Sir Clement Hill, Admiral Sir Erasmus Ommanney, Sir John Thurston, Admiral Sir George Nares, Sir Malcolm Fraser, Sir Charles Lawson, Captain Agar, Colonel F. Bailey, Mr. W. T. Blanford, Hon. George C. Brodrick, Mr. E. L. S. Cocks, Sir D. Colnaghi, Colonel Dalton, Major Darwin, Colonel Farquharson, Professor J. Geikie, Captain Lugard, Mr. G. S. Mackenzie, Mr. H. J. Mackinder, General McMahon, Admiral Markham, Master of the Merchant Tailors Company, Mr. A. P. Maudslay, Mr. Delmar Morgan, Mr. S. Vaughan Morgan, Dr. John Murray, Mr. E. G. Ravenstein, Mr. Howard Saunders, Mr. P. L. Sclater, Mr. H. Seebohm, Mr. H. M. Stanley, Rev. S. A. Steinthal, General R. J. Jocelyn Stewart, Major Hon. M. G. Talbot, Colonel Thackeray, Mr. Spencer Todd, Colonel Trotter, General J. T. Walker, Admiral Wharton, Major Wingate, Colonel Yate, Captain Yate, Captain Younghusband.

After dinner the PRESIDENT proposed the toasts of "The Queen," the Patron of the Society, and "The Prince of Wales and the Duke of York," respectively Vice-Patron and Honorary President of the Society.

The PRESIDENT then gave the toasts of the Society's medallists, the Right Hon. George N. Curzon and Dr. John Murray, to which Dr. MURRAY replied.

Major L. DARWIN proposed "Our Guests," to which M. SEMIONOFF, Dr. G. NEUMAYER, and Professor A. DE LAPPARENT replied.

The toast of "The President" was proposed by the Hon. W. W. ROCKHILL.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. R. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Bosnia and Herzegovina. **Moser.**
L'Orient Inédit. À travers la Bosnie et l'Herzegovine. Par Henri Moser. Dessins de Georges Scott, Paris, 1895. Size 6 × 9, pp. 76. *Illustrations. Presented by the Author.*

England and Wales—Gazetteer. **Brabner.**
The Comprehensive Gazetteer of England and Wales. Edited by J. H. F. Brabner. [Vol. V. New—Sha.] London: W. Mackenzie, [1895]. Size 10½ × 7½, pp. 348. *Maps, Plans, and Plates. Presented by the Editor.*

Europe. **Philippson, Neumann, and Sievers.**
Europa. Eine allgemeine Landeskunde. Von Dr. A. Philippson und Prof. Dr. L. Neumann. Herausgegeben von Prof. Dr. Wilhelm Sievers. Leipzig and Vienna: Bibliographisches Institut, 1894. Size 10½ × 7½, pp. x. and 636. *Maps and Illustrations (some coloured). Price 16s.*

NORTH AMERICA.

American Glacial Deposits. *J. Geology* **3** (1895): 270–277. **Chamberlin.**
The Classification of American Glacial Deposits. By T. C. Chamberlin.

Bermudas. **Forsstrand.**
Bland Oleandrar och Liljor. Minnen från en Sommar på Bermuda eller Somers Öar . . . Af Carl Forsstrand. Stockholm: H. Sandbergs Bokhandel [1895]. Size 10 × 6½, pp. 122. *Map and Plates. Presented by the Author.*

Canada—British Columbia. *Verh. Ges. Erdk. Berlin* **22** (1895): 265–270. **Boas.**
Herr F. Boas: Zur Ethnologie von Britisch-Columbien.

A summary of the author's investigations into the ethnography of British Columbia, so far as these are of a geographical character.

Canada—Geological Survey. **Dawson.**
Summary Report of the Geological Survey Department for the year 1894. Ottawa: S. E. Dawson, 1895. Size 10 × 6½, pp. 126. *Presented by the Geological Survey Department of Canada.*

Canada—Tides. **Dawson.**
Report of W. Bell Dawson, C.E. Survey of Tides and Currents in Canadian Waters. Ottawa, 1894. Size 10 × 6½, pp. 14.

Survey of Tides and Currents in Canadian Waters. Report of Progress. By W. Bell Dawson. Ottawa: Government Printing Bureau, 1895. Size 10 × 6½, pp. 30. *Maps.*

Labrador. **Grenfell.**
Vikings of To-day; or, Life and Medical Work among the Fishermen of Labrador. By Wilfred T. Grenfell. London: Marshall Bros., 1895. Size 8½ × 6, pp. xvi. and 240. *Illustrations. Price 3s. 6d. Presented by the Publishers.*

A vivid account of Labrador and the life of the fishermen and natives of the coast.

Lake Huron, &c.—Sailing Directions. ———
No. 108—Part III. U.S. Hydrographic Office. Sailing directions for Lake Huron, Straits of Mackinac, St. Clair and Detroit Rivers, and Lake St. Clair. Washington: Government Printing Office, 1895. Size 9½ × 6, pp. viii. and 110. *Chart and Plates. Presented by the U.S. Hydrographic Office.*

North American Lakes. *B.S. normande G.* **16** (1894): 388–402. **Gravier.**
Carte des grands lacs de l'Amérique du Nord dressée en 1670 par Bréhan de Gallinée. Par Gabriel Gravier. *With Map.*

An account of seventeenth-century exploration in the American lake-region, with facsimile of Galinée's map of 1670.

United States. **Moran.**
Johns Hopkins University Studies in Historical and Political Science. Thirteenth Series. V. The Rise and Development of the Bicameral System in America. By Thomas Francis Moran. Baltimore: The Johns Hopkins Press, 1895. Size 9½ × 6, pp. 54.

United States—California. **Hunt**

Johns Hopkins University. Studies in Historical and Political Science. Thirteenth Series. VIII. The Genesis of California's First Constitution (1846–49). By Rockwell Dennis Hunt. Baltimore: The Johns Hopkins Press, 1895. Size 9½ × 6, pp. 60.

United States—Indian Territory. **Holmes.**

Smithsonian Institution, Bureau of Ethnology, J. W. Powell, Director. An Ancient Quarry in Indian Territory. By William Henry Holmes. Washington: Government Printing Office, 1894. Size 10 × 6½, pp. 20. *Map and Plates. Presented by the Smithsonian Institution.*

United States—Means of Transport. *Rev. Scientifique* (4) 3 (1895): 551–559. **Wuarin.**

Les moyens de transport aux États-Unis. Par Louis Wuarin.

United States—New York. *B. American G.S.* **27** (1895): 21–29. **Gannett.**

The Mapping of New York State. By Henry Gannett. *With Maps.*

An interesting sketch of the history and present position of the survey of New York state, with one map showing the triangulated lines, and another indicating the areas which have been accurately mapped.

United States—Soda Deposits. *J. Franklin I.* **139** (1895): 271–283, 341–351. **Chatard.**

The Natural Soda Deposits of the United States. By Dr. Thos. M. Chatard.

A description of the alkaline deposits and the method of manufacturing soda in the far west of the United States.

CENTRAL AND SOUTH AMERICA.

Argentine Languages—The Lule. **Quevedo.**

Los Lules. Estudio filológico y Calepino Lule-Castellano. Seguido del Catecismo. Vade Mecum para el Arte y Vocabulario del P. Antonio Machoni S. J. Por Samuel A. Lafone Quevedo, M.A. (Del Boletin del Instituto Geografico Argentino. Tomo xv., pajs 185 y siguientes.) Buenos Aires, 1894. Size 10½ × 7, pp. 146. *Presented by the Author.*

Argentine Republic. **Quevedo.**

Tesoro de Catamarqueñismos. Nombres de lugar y apellidos Indios con etimologias y eslabones aislados de la lengua Canana. Por Samuel A. Lafone Quevedo. Articulo publicado en los "Anales de la Sociedad Cientifica Argentina," Tomo xxxix., paginas 77 y siguientes. Buenos Aires: Imp. de Pablo Coni e Hijos, 1895. Size 10 × 6½, pp. 36. *Presented by the Author.*

Brazil—Bow and Arrows. **Meyer.**

Bogen und Pfeil in Central-Brasilien. Ethnographische Studie von Dr. Hermann Meyer. Leipzig: Bibliographischen Institut [n.d. 1895]. Size 10 × 7, pp. vi. and 56. *Map and Plates. Presented by the Author.*

Maps are given showing the distribution of different types of bows and arrows in Brazil.

Central America—Hieroglyphs. **Saville.**

A Comparative Study of the Graven Glyphs of Copan and Quirigua. A preliminary paper. By Marshall H. Saville. Reprinted from the *Journal of American Folk-Lore*, July—September, 1894. Size 9½ × 6½, pp. [8]. *Illustrations.*

Ecuador—Galapagos Islands. *Verh. Ges. Erdk. Berlin* **22** (1895): 246–265. **Wolf.**

Herr Dr. Th. Wolf: Die Galápagos-Inseln. *With Map.*

Guatemala. *Petermann's M.* **41** (1895): 105–109. **Sapper.**

Neue Beiträge zur Kenntnis der Vulkane von Guatemala. Von Dr. K. Sapper in Guatemala. *With Map.*

Nicaragua Canal. *J. Franklin I.* **139** (1895): 425–438. **Sherwood.**

The Nicaragua Canal. By G. W. Sherwood.

Venezuela. **Scruggs.**

British Aggressions in Venezuela; or, the Monroe Doctrine on Trial. By William L. Scruggs. Second Edition. Atlanta, Ga.: the Franklin Printing and Publishing Co., 1895. Size 9½ × 6½, pp. 30. *Map. Presented by the Author.*

AUSTRALASIA AND PACIFIC ISLANDS.

New Guinea. **Kan.**

Nogmaals Nieuw-Guinea. Door Prof. Dr. C. M. Kan. I.—III. Leiden: E. J. Brill, 1894. Size 9½ × 6, pp. (i.) 22, (ii.) 26, map, (iii.) 32.

A series of reprints from the *Tijdschrift* of the Royal Dutch Geographical Society.

New Zealand. *J.R. Colonial I.* 26 (1895): 489–512. **Ward.**

New Zealand in 1895. By the Hon. J. G. Ward.

Queensland—Artesian Wells. **Jack.**

Queensland. Department of Mines, Geological Survey. Bulletin No. 1. Artesian Water in the Western Interior of Queensland. By Robert L. Jack. Brisbane: E. Gregory, 1895. Size 9 × 6, pp. 16. *Presented by the Author.*

Samoa. *J. Polynesian S.* 4 (1895): 47–58. **Stair.**

Samoa: whence peopled? By the Rev. John B. Stair.

POLAR REGIONS.

Antarctic Expedition. *J.R. United Service I.* 39 (1895): 589–606. **Markham.**

The Antarctic Expedition. From a Naval point of view. By Clements R. Markham, C.B., etc.

The paper by Mr. Markham is followed by a discussion in which a number of naval authorities took part, all strongly in favour of a British naval expedition being sent out.

Greenland—Glaciers. **Chamberlin.**

Bulletin of the Geological Society of America. Vol. 6, pp. 199–220, pls. 3–10. Recent Glacial Studies in Greenland. Annual Address by the President, T. C. Chamberlin. Rochester, 1895. Size 10½ × 7, pp. [22]. *Presented by the Author.*

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Antipodal Maps. *Deutsche Rundschau G.* 17 (1895): 385-391. **Peucker.**

"Unsere Antipoden." Von Dr. Karl Peucker in Wien. *With Maps.*

Three maps are given, showing by the method of superposition the relations of the Antipodes, Periokes and Antokes.

Astronomy. **Tischner.**

Le Phénomène fondamental du Système Solaire. Par August Tischner. Leipzig: G. Fock, 1895. Size 8 × 5½, pp. 48. *Illustrations. Presented by the Author.*

Atmospheric refraction. **Tischner.**

Le pouvoir grossissant de l'atmosphère. Par August Tischner. Leipzig: G. Fock, 1892. Size 8 × 5½, pp. 12. *Presented by the Author.*

Decimal Division of Angles and Time. **Rey-Pailhade.**

Société de Géographie de Toulouse. Application simultanée et parallèle du système decimal à la mesure des angles et du temps. Rapport par M. J. de Rey-Pailhade, 1895. Size 11 × 7½, pp. 24. *Presented by the Author.*

Earthquake Phenomena. *C.R.* 120 (1895): 1183–1186. **Montessus.**

Relation entre le relief et la sismicité. Note de M. de Montessus.

Ethnography. *Globus* 68 (1895): 1–6. **Köppen.**

Die Dreigliederung des Menschengeschlechtes. Von W. Köppen. *With Map.*

The map shows the distribution of the three divisions of the human race about the year 1500.

Geodesy. **Hirsch.**

Comptes-Rendus des séances de la Commission Permanente de l'Association Géodésique Internationale réunie à Innsbruck du 5 au 12 Septembre 1894. Rédigés par le Secrétaire perpétuel A. Hirsch. Suivis des Rapports sur les travaux géodésiques accomplis dans les différents pays pendant la dernière année. Avec sept cartes et planches. Berlin: Georg Reimer, 1895. Size 11½ × 9, pp. 256. *Presented by the Centralbureau der Internationalen Erdmessung.*

Geographical Distribution. **Dixon.**

A New Law of Geographical Dispersal. By Chas. Dixon. From the *Fortnightly Review*, April, 1895. Size 10 × 6½, pp. [18].

A criticism of existing theories of the distribution of birds, with suggestions as to a new theory, the complete enunciation of which is promised in a forthcoming book.

Geographical Instruments. **Beehler.**

The Solarometer, a modern navigating instrument. By Lieut. W. H. Beehler. Reprinted from the *Proceedings* of the United States Naval Institute, Volume xxi. No. 1. Whole No. 73. Annapolis, Md., 1895. Size 9 × 6, pp. [46]. *Plates.*

Glaciers. *J. Geology* 3 (1895): 278-288. **Reid.**

The Variations of Glaciers. By Harry Fielding Reid.

Limnology—Lake Temperature. *M.G. Ges. Wien* 38 (1895): 119-150. **Koch.**

Die Temperaturbewegung des Gmundner- oder Traunsee's und Traunabflusses im Winter 1894-95. . . . Von Prof. Dr. Gustav Adolf Koch.

Limnology—Lake-water. *C.R.* 120 (1895): 1438-1440. **Delebecque and Le Royer.**

Sur les gaz dissous au fond du lac de Genève. Note de MM. André Delebecque et Alexandre Le Royer.

The authors have invented a new form of water-bottle, consisting of a glass vessel of 2000 c.c. capacity, which is sunk full of mercury and with its narrow opening directed upwards. At the desired depth the vessel is reversed by a "messenger," the mercury escapes, and its place is taken by water; the mercury is kept in a metal vessel below, and serves to seal the opening of the glass collector. The apparatus was specially designed for collecting dissolved gases.

Map Projections. *B S.G. Paris* (7) 15 (1894): 605-616. **Coatpont.**

Note sur les projections des cartes géographiques. Exposé et application de la projection la moins dissemblable. Par le Général de Coatpont. *With Map.*

Meteorological—Lakes and Climate. **Ule.**

Naturwiss. Wochenschrift 10 (1895): 297-299.

Der Einfluss der Binnenseen auf das Klima. Von Dr. Willi Ule in Halle a. d. S.

The conclusions arrived at by Dr. Ule will be noticed elsewhere.

Morphology of the Earth. *M.V. Erdk. Leipzig*, 1894 (1895): 39-95. **Güttner.**

Geographische Homologien an den Küsten mit besonderer Berücksichtigung der Schwemmlandküsten. Von Paul Güttner.

An interesting attempt to bring system into the classification and study of the forms of coast-lines.

Morphology of the Earth. **Lapworth.**

The Face of the Earth. Abstract of Paper read by Professor C. Lapworth, F.R.S., at the Royal Geographical Society, April 23, 1894. Birmingham: The *Journal* Printing Offices, 1894. Size 8½ × 6, pp. 14. *Presented by the Author.*

Oceanography. *B.S.G. Comm. Bordeaux* 18 (1895): 129-139. **Thoulet.**

De l'étude de l'océanographie par les Societiés de Géographie ayant leur siège au voisinage de la mer. Par J. Thoulet.

Oceanography—Baltic Sea. *Petermann's M.* 41 (1895): 81-86, 111-118. **Krümmel.**

Zur Physik der Ostsee. Von Prof. Dr. O. Krümmel. *With Map.*

Professor Krümmel gives here an account of the recent oceanographical researches carried out on the Baltic.

Oceanography—Baltic Sea. *B. Geolog. I. Upsala* 2, 1894 (1895): 1-38. **Munthe.**

Preliminary Report on the Physical Geography of the Litorina-Sea. By Henr. Munthe. *With Two Maps.*

A geological study of the period of relative high salinity in the post-glacial history of the Baltic during which the *litorina* strata of the Baltic were formed.

Oceanography—Waves. *C.R.* 120 (1895): 1381-1386. **Boussinesq.**

Sur l'extinction graduelle de la houle de mer aux grandes distances de son lieu de production; formation des équations du problème. Par M. J. Boussinesq.

Oceanography—Waves. *Sitzb. A.W. Berlin* (1895): 343–362. **Wien.**

Über die Gestalt der Meereswellen. Von Dr. Willy Wien in Charlottenburg.

Photographic Surveying. *C.R.* **120** (1895): 1246–1249. **Laussedat.**

Note sur les levers photographiques exécutés en 1894 par les ingénieurs canadiens et le service du "Coast and geodetic Survey" des États-Unis pour la délimitation de l'Alaska et de la Colombie britannique. Par M. A. Laussedat.

Physical Geography. **Powell.**

National Geographic Monographs prepared under the auspices of the National Geographic Society. Vol. I. No. 1. Physiographic Processes. By John W. Powell. No. 2. Physiographic Features. By the same. No. 3. Physiographic Regions of the United States. By the same. New York, etc.: American Book Co., 1895. Size 12 × 8, pp. 100. *Maps and Illustrations.*

This new publication is referred to in the *Monthly Record.*

Terrestrial Magnetism. ——

No 109a. U.S. Hydrographic Office. Contributions to Terrestrial Magnetism, the Variation of the Compass. As observed at fifty of the principal maritime stations from the earliest times to the present, together with equations for each station, from which values may be predicted and annual rates of change found. Washington: Government Printing Office, 1895. Size 9½ × 6, pp. 54. *Presented by the U.S. Hydrographic Office.*

Terrestrial Physics. *C.R.* **120** (1895): 1257–1259. **Andrade.**

Sur un système explosif propre à mettre en évidence la rotation du globe terrestre. Note de M. Jules Andrade.

A mathematical discussion.

GENERAL.

Bibliography—Asiatic Society of Japan. ——

General Index to the Transactions of the Asiatic Society of Japan. Vol. I. to Vol. XXIII. April, 1895. Yokohama. Size 9½ × 6½, pp. 42.

Bibliography—Geological. ——

Geological Literature added to the Geological Society's Library during the Half-year ended December, 1894. London: Geological Society, 1895. Size 9 × 6, pp. 58. *Price 2s. Presented by the Geological Society.*

Bibliography—U.S. Bureau of Ethnology. **Hodge.**

Smithsonian Institution, Bureau of Ethnology, J. W. Powell, Director. List of the Publications of the Bureau of Ethnology, with Index to Authors and Subjects. By Frederick Webb Hodge. Washington: Government Printing Office, 1894. Size 10 × 6½, pp. 26. *Presented by the Smithsonian Institution.*

Biography—Daendels and Raffles. **Deventer.**

Daendels—Raffles. A dissertation on the two celebrated Governors of Java during one of the most important periods in the history of the Dutch Colonies in the East Indies. By M. L. van Deventer. Translated from the 'Indische Gids,' by Geo. G. Batten. London: Printed . . . by E. Marlborough & Co. [1894]. Size 8½ × 5½, pp. 128.

Biography—Dana. *J. Geology* **3** (1895): 335–340. **Farrington.**

James D. Dana as a Teacher of Geology. By Oliver C. Farrington.

Biography—Laube. *Deutsche Rundschau G.* **17** (1895): 421–422. ——

Professor Dr. Gustav Karl Laube. *With Portrait.*

Biography—Pancaldo. **Peragallo.**

Leone Pancaldo. Sussidi documentari per una sua monografia. Studi di Prospero Perugallo. Lisbon: Typographia Portuense, 1895. Size 9 × 6½, pp. 76. *Presented by the Author.*

An extract from the great Italian work, 'Raccolta di Documenti e Studi, publicati dalla R. Commissione Columbiana.'

Biography—Rawlinson. *Deutsche Rundschau G.* 17 (1895): 422–424. ———
Sir Henry Rawlinson. *With Portrait.*

Biography—Reclus. *Scottish G. Mag.* 11 (1895): 248–251. ———
M. Elisée Reclus and the *Géographie Universelle. With Portrait and Illustration.*

Biography—Sandeman. **Thornton.**
Colonel Sir Robert Sandeman: his Life and Work on our Indian Frontier. A Memoir, with selections from his correspondence and official writings. By Thomas Henry Thornton. London: John Murray, 1895. Size 9 × 6, pp. xxiv. and 392. *Portrait, Map, and Illustrations. Price* 18*s*. *Presented by the Author.*

Sir Robert Sandeman's life was so closely associated with the north-west frontier of India that his biography is of necessity a largely geographical work, and is as appropriately illustrated by the large map of the district where he worked as by the excellent portrait of the man himself.

Biography—Seutter. *M.V. Erdk. Leipzig* 1894 (1895): 1–38. **Sandler.**
Matthäus Seutter und seine Landkarten. Von Dr. Chr. Sandler (München).

Biography—Slatin Pasha. *Deutsche Rundschau* 17 (1895): 374–375. ———
Slatin Pascha. *With Portrait.*

Biography—Slevin. **Davidson.**
In Memoriam. Thomas Edwards Slevin, LL.D. [By Professor George Davidson.] Size 10 × 6½, pp. 4. *Presented by the Geographical Society of the Pacific.*

Biography—Xántus. *Abrégé B.S. Hongroise G.* **22** (1894): 49–54. **Aladár.**
Jean Xántus. Par György Aladár.

Columbus. **Peragallo.**
Disquisizioni Colombine. No. 1. La Nuova Scuola Spagnuola Anticolombina. Nos. 2 e 3. Epoca dell' arrivo di Colombo in Portogallo. La sfera di Dante de Rinaldi, e il Sig. Harrisse, Studi di Prospero Peragallo. Lisbon: Tipografia Nazionale, 1893–94. Size 10 × 6½, pp. (No. 1) 70, (Nos. 2 & 3) 100. *Presented by the Author.*

Educational. **Montefiore.**
Geographical Methods. A Chapter of Suggestions. By Arthur Montefiore. London: Office of the *Educational Review*, 1895. Size 9½ × 6½, pp. 36. *Price* 6*d*. *Presented by the Author.*

Educational. *B. American G.S.* **27** (1895): 30–41. **Russell.**
Reports of a Conference on Geography. By Israel C. Russell.

This report will be referred to elsewhere.

Electric Measurement. **Naber.**
Standard Methods in Physics and Electricity criticised, and a test for Electric Meters proposed. By H. A. Naber. London: G. Tucker, 1894. Size 9 × 6, pp. 114. *Illustrations. Price* 5*s*. *Presented by the Author.*

Geography and its Scope. *G.Z.* 1 (1895): 1–19. **Hettner.**
Geographische Forschung und Bildung. Vom Herausgeber (Dr. Alfred Hettner). *With Map.*

An answer to the question, "What is geography?" expressing the aims of this new journal, the *Geographische Zeitung.*

German Colonies. ———
Jahresbericht der Deutschen Kolonialgesellschaft. 1894. Berlin, 1895. Size 10 × 7, pp. 54.

Historical—Elizabethan Sailors. **Froude.**
English Seamen in the Sixteenth Century. Lectures delivered at Oxford, Easter terms 1893–4. By James Anthony Froude. New Edition. London: Longmans & Co., 1895. Size 7½ × 5, pp. 310. *Price* 6*s*.

The English seamen treated in this volume are Hawkins, Drake, and their comrades who met the Armada.

Historical Geography. **Duméril.**

L'Esprit des Croisades au xvme siècle. Les Portugais; Christophe Colomb. Par A. Duméril. From the *Bulletin* of the Société Academique, *Franco-Hispano-Portugaise Toulouse* 12 (1894), 17–32.

History—Cartography. **Wolkenhauer.**

Leitfaden zur Geschichte der Kartographie in tabellarischer Darstellung. Mit Hinweis auf die Quellen-Litteratur unter besonderer Berücksichtigung Deutschlands, Oesterreichs und der Schweiz. Von Dr. W. Wolkenhauer in Bremen. Breslau: J. Hirt, 1895. Size 9 × 6, pp. 94. *Presented by the Author.*

Dr. Wolkenhauer has undertaken a large piece of work in producing this chronology of cartography, and one that must prove useful. The nature of the task makes it almost impossible to attain completeness; but of this the compiler is fully conscious, and he asks for corrections and suggestions.

Languages. ———

A short cut for beginners to French, Portuguese, and Fiote. By a trader. Loango: Imp. de la Mission, 1895. Size 5½ × 4½, pp. 22. *Presented by R. C. Dennett, Esq.*

Native Races. ———

Report of a Meeting held in Grosvenor House on Friday, May 3, 1895, in connection with the Native Races and the Liquor Traffic United Committee, and containing important speeches by the Duke of Westminster, K.G., and Sir George Taubman Goldie, K.C.M.G. Westminster: Offices of the Native Races and the Liquor Traffic United Committee. Size 8½ × 6, pp. 16.

Portuguese Colonies. *B.S.G. Lisboa* 13 (1894): 969–1040. **Gallego.**

Descripção e roteiro das possessões portuguezas do continente da Africa e da Asia no XVI. seculo pelo cosmographo portuguez João Gallego. Manuscripto do Archivo Mediceo publicado pela Typographia Real de Florença, em 1862 e agora annotado e commentado por Gomes de Brito.

Prince Henry the Navigator. ———

O centenario do Infante em Sagres, Sessão da Sociedade de Geographia de Lisboa em 12 de março de 1894. Size 10 × 6½, pp. 12. *Presented by the Lisbon Geographical Society.*

Description of the celebration of the fourth centenary of Prince Henry the Navigator at the Lisbon Geographical Society.

Ptolemy's Geography in Arabic. **Nallino.**

Reale Accademia dei Lincei (Anno CCXCI. 1894). Al-Huwârizmî e il suo rifacimento della Geografia di Tolomeo. Memoria di Carlo Alfonso Nallino. Rome, 1895. Size 12 × 9, pp. 54. *Presented by the Author.*

A review of the evidence to show that the 'Book of the figure of the Earth,' by the Arab writer Al-Ḫuwârizmî, was based on Ptolemy's geography.

Sense of Locality. **Baker.**

How to cultivate the "Bump of Locality." By C. Cantley Baker. [From *Colonia* for April, 1895.] Size 8 × 5½, pp. 8. *Presented by the Author.*

Surveys—Aneroid. *J. of Geology* 3 (1895): 128–137. **Rolfe.**

Use of the Aneroid Barometer in Geological Surveying. By C. W. Rolfe. *With Plates.*

Shows how the aneroid may be employed for contouring a country, and the sources of error inherent in its use kept under control.

Time-measurement. **Rey-Pailhade.**

Société de Géographie de Toulouse. Application simultanée et parallèle du système décimal à la mesure des angles et du temps. Rapport par M. J. de Rey-Pailhade. 1895. Size 11 × 7½, pp. 24. *Presented by the Author.*

Travel. **Suisted.**

From New Zealand to Norway. By Mrs. James Suisted. Dunedin: Otago *Daily Times* Office, 1894. Size 8 × 5½, pp. 66. *Presented by the Author.*

NEW MAPS.

By J. COLES, *Map Curator*, R.G.S.

EUROPE.

Germany. **Lepsius.**

Geologische Karte des Deutschen Reichs, auf grund der unter Dr. C. Vogels Redaktion in Justus Perthes' Geograph. Anstalt ausgeführten Karte in 27 Blattern in 1 : 500,000 bearbeitet von Dr. Richard Lepsius o. ö Professor an der Technischen Hochschule und Director der Geologischen Landesanstalt in Darmstadt. *Price* 3 *marks*.

This part contains Sheet 18, Frankfurt-on-Main, and Sheet 24, Regensburg. The colours are well chosen, and the registering perfect.

ASIA.

Indian Government Surveys. **Surveyor-General of India.**

Indian Atlas, 4 miles to an inch, Quarter Sheet: 31 N.E., parts of districts Ferozepore and Ludhiana, and of Patiala, Nabha, Faridkot, and Jind (Native States), Punjab; 34 s.w., parts of Merwara (Ajmere), Jodhpore, and Oodeypore (Native States, Rajputana); 49 N.E., parts of districts Moradabad, Meerut, Muzaffarnagar, and Bijnor (N.W. Provinces), Delhi and Karnak (Punjab); 67 S.E., parts of districts Bareilli, Pilibhit and Sharjahanpur (N.W. Provinces), and Khari (Oudh); 70 s.w., parts of districts Sangor, Damoh (Central Provinces), Jhansi (N.W. Provinces), and of Native States Gwalior, Bhopal, and Panna (C.I. Agency); 74 N.W., parts of districts Narsinghpur, Saugor, Damoh, Hoshangabad (Central Provinces), and of Native States Bhopal, Gwalior, Nawab, Basoda, and Muhammadgarh (C.I. Agency); 72 S.E., parts of districts Nagpur, Bhandara, Raipur, and Chanda (Central Provinces); 91 s.w., parts of districts Raipur, Balaghat, Bhandára, and Chanda (Central Provinces); 124 S.E., parts of districts Kamrup, Nowgong, Darrang, Cachar, Khasi and Jaintia, and Naga Hills (Assam).—North-West Provinces and Oudh Survey, 1 inch to a mile, Sheet No. 47 (2nd edit.), districts Moradabad, Bijnor, and Naini Tal and Rampur State, Seasons 1868-69, 1871–76, and 1890-91; No. 48 (2nd edit.), district Maradabad and Rampur State, Seasons 1871–72, 1875–76, and 1890-91; No. 50 (2nd edit.), districts Moradabad and Buduan and Rampur State, Season 1872–74, 1876-77, and 90-91; No. 66, districts Moradabad and Bareilli and Rampur State, Seasons 1868-72, 1875–76, and 1890-91; No. 82, districts Bareilli, Naini Tal, and Pilibhit, Seasons 1866-69, 1870-71, and 1888-89; No. 99 (2nd edit.), districts Pilibhit and Kheri, Seasons 1865-67, 1867–68, and 1871-72.—Lower Burma Survey, 1 inch to a mile, Sheet No. 231, districts Henzada, Tharrawaddy, and Hanthawaddy, Seasons 1880-84.—Punjab Survey, 1 inch to a mile, No. 6, district Peshawar, Seasons 1863-65 and 1869–70; Nos. 284, 285, 306, 307, (part of) district Kángra (Bara-Bangáhal), Tahsil Palanpur; Map of Bara-Bangáhal, district Kángra.—Bengal Survey, 1 inch to a mile. No. 223, district Cuttack (Killa Kujang), season 1888-89; No. 224, district Cuttack (Killa Kujang), Season 1888-89; No. 375, districts Mymensingh and portion of Sylhet (Assam), Seasons 1854-57 and 1861–62.—Bombay Survey, 1 inch to a mile, No. 160, parts of Thana, Nasik, and Daman (Portuguese) districts, and Dharampor and Jawhar States, Seasons 1874-76, 1884–85, and 1891-92; No. 474, district Ratnagiri, Season 1892–93.—Upper Burma, 1 inch to 16 miles, 1894 (2nd edit.), 2 sheets, without hills.—Upper Burma, 1 inch to 16 miles, 1894 (2nd edit.), with hills.—Punjab and Kashmir, 1 inch to 16 miles, 4 sheets, corrections to 1894 (skeleton edit.).—District Southal Parganas, Lower Provinces, Bengal, 4 miles to an inch, additions and corrections up to July, 1894.—District Unao, N.W. Provinces and Oudh, 1 inch to 8 miles, 1895.—District Sharabad, Bengal, 1 inch to 8 miles, 1894.—District Nuddea, Bengal, 1 inch to 8 miles, 1890.—District Darjeeling, Bengal, 1 inch to 8 miles, 1889.—District Hooghly, Bengal, 1 inch to 8 miles, 1889.—*Presented by H.M. Secretary of State for India, through India Office.*

MADAGASCAR.

Madagascar. **Hansen.**

Carte de Madagascar dressée d'après les dernières explorations. Par J. Hansen. Cartographe du Ministère des Colonies, 1895. Librarie: Augustin Challamel, Paris. Scale 1 : 3,250,000 or 50·8 stat. miles to an inch. *Price* 1*fr.* 25*c.* *Presented by Mons. J. Hansen.*

At a time when so much attention is turned to the progress of the French expedition in Madagascar, this map will be found useful for general reference by those interested in that island. It has been brought up to date, and, so far as its scale permits, represents the present state of our geographical knowledge of Madagascar. Insets are given showing the climatic conditions of Madagascar at different periods of the year, and the extent of the French possessions in Africa, as well as the lines of communication with Madagascar by French steamers and telegraph cable.

POLAR REGIONS.

South Pole. **v. Haardt.**

Süd-Polar-Karte von V. v. Haardt. Mass-stab der Hauptkarte 1: 10,000,000. Mass-stab der Nebenkarten 1: 50,000,000 u. 1: 100,000,000. Gewidmet dem unermüdlichen Förderer der antarktischen Forschungen Herrn Geheimen Admiralitäts-Rath Dr. G. Neumayer anläszlich des XI. Deutschen Geographentages zu Bremen im April 1895. *Presented by Dr. G. Neumayer.*

This is a carefully compiled map of the Antarctic regions, on which all the tracks of explorers are laid down, in addition to which, by means of isotherms and isobars, separate maps, and notes, a large amount of information is given with regard to magnetism, winds, temperature, atmospheric pressure, etc.

South Polar Regions. **Kristensen.**

Map of *Antarctic's* track to Victoria Land. By Captain Leonard Kristensen. 1894–95.—Robertson Bay. By Captain L. Kristensen of the *Antarctic*, with the assistance of Sir James Ross's observations.—Meteorological observations taken on board the *Antarctic* during the months December and January, 1895. Photo-lithographed at the Department of Lands and Survey, Melbourne, by T. F. McGauran.

Two of these sheets are charts on which the geographical results of Captain Leonard Kristensen's voyage towards the South Pole in the *Antarctic* are laid down, while the third sheet contains the meteorological observations taken on board the *Antarctic* during the months of December, 1894, and January, 1895.

GENERAL.

The World. **Jones.**

The Model of the Earth. By Thomas Jones. A. H. Andrews & Co., Chicago. *Presented by Thomas Jones, Esq.*

This is a relief globe which, after allowing for the exaggeration in vertical scale, shows the Earth as it would appear if all its water were drained off, thus exhibiting the peculiarities of the ocean beds, the depths being indicated by raised figures. The globe is made of copper, and is 20 inches in diameter. The vertical scale is forty times the scale of distance, and a manual giving the elevations of the Earth's surface, and various other items of interest, accompanies the globe. In common with all relief models of the Earth, or large portions of its surface, Mr. Jones's globe labours under the disadvantage of conveying to young students an erroneous impression of the proportions existing between the elevations and depressions as compared with the whole mass. In the hands of a well-informed and careful teacher, the globe might be of service in giving a general idea of the features of the Earth's surface.

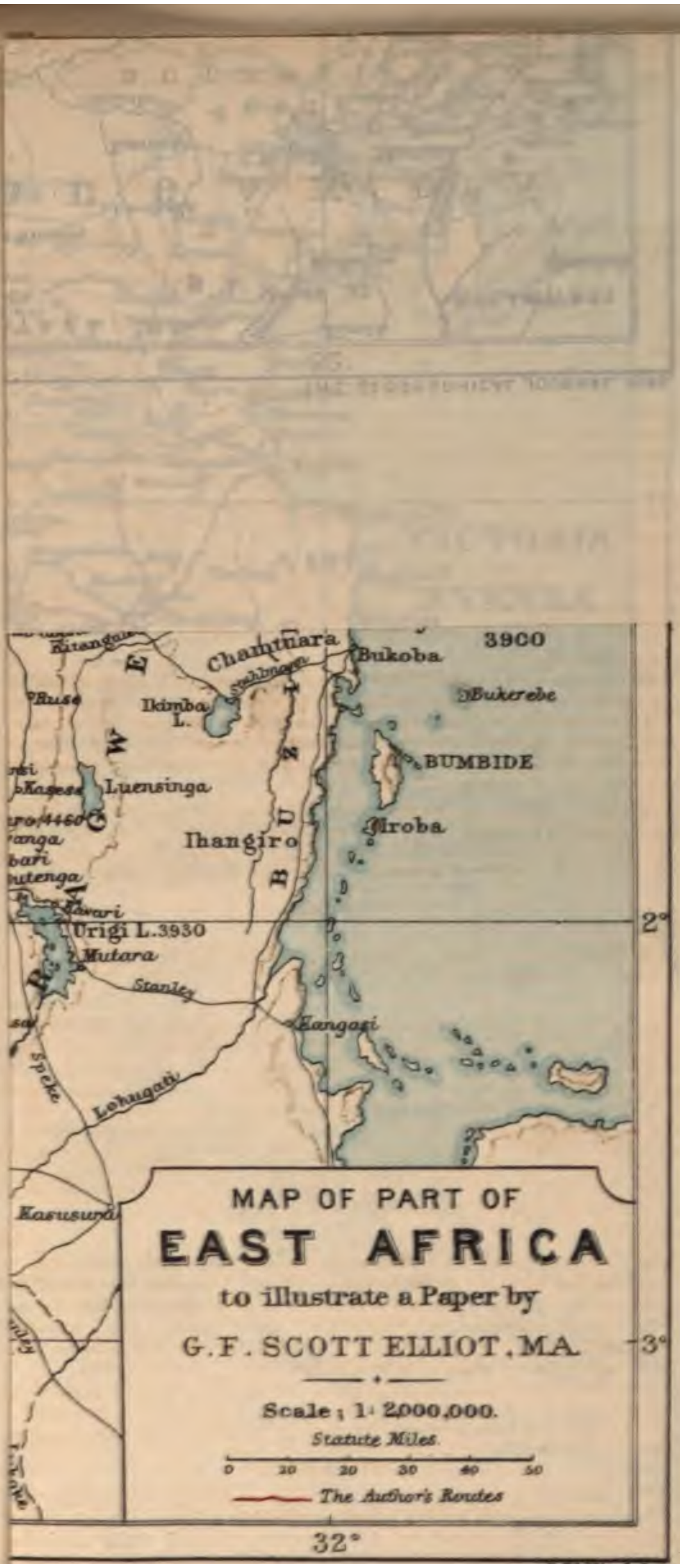
The World. **Langhans.**

Kleiner Handelsatlas für Lehranstalten, sowie zum Selbstunterricht. 12 Kartenseiten mit 42 Darstellungen. Eine Ergänzung zu jedem geographischen Atlas. Begleitworte: Die wichtigeren Rohstoffe und Industrie-Erzeugnisse ein Welthandel und-Verkehr mit besonderer Berücksichtigung der Handelswaren des deutschen Zollgebietes. Von Paul Langhans. Gotha: Justus Perthes, 1895. *Price 2 marks.*

This is an atlas of commercial geography, and is intended to be used in connection with any of the atlases of or maps illustrating political geography. It contains copious notes, and the maps are well suited to the purpose for which they have been published.

PHOTOGRAPHS.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.



MAP OF PART OF
EAST AFRICA
to illustrate a Paper by
G. F. SCOTT ELLIOT, M.A.

Scale ; 1 : 2,000,000.
Statute Miles.

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NOTES ON A JOURNEY TO SOME OF THE SOUTH-WESTERN PROVINCES OF SIAM.*

By H. WARINGTON SMYTH, LL.B., of the Royal Department of Geology and Mines, Bangkok.

The journey on which these notes were made was undertaken for the Siamese Government, for the purpose of visiting and reporting on the newly opened tin deposits in Ratburi, the tin-mines of Puket and other provinces on the west coast, and surveying certain mining areas, while at the same time I was to obtain what information I could at Mergui on the question of the best manner of encouraging and controlling pearl fisheries.

Thus, our course being first west to Ratburi, and the mines being close to the frontier, I decided to go over by the Tenasserim river to Mergui, and thence by sea to Puket for our southern work, returning by way of Renong and Kra to Chumpon.

The party consisted of my three Siamese assistants, cook, and extra hands—eleven all told, plus my Shan dog Rover. "Master Cheerful," as his name translates, he of the love-songs of our Luang Prabang trip, was again one of us, with several other old hands. One, "Master Star," was said to be very musical, and capable of incredible tremolos on a high note, and so of course a great addition to the party.

I. Bangkok to Tavoy.

We started westward bound from Bangkok on a misty February morning, in a 35-feet chow-boat of 7-feet beam and 14-inches draft, the flood tide taking us into the great main waterway connecting the Meinam and Tachin rivers.

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* Paper read at the Royal Geographical Society, January 28, 1895. Map, p. 496.

All the morning markets were busy, the hundreds of small canoes, laden with the products of the country round, moving slowly in and out with never a collision or a row; the air laden with the hum of talk, each one bargaining, gossiping, and chaffing as she got the opportunity. Very few men are to be seen among these market folks, unless a few Chinamen. The Siamese, if he wants a good bargain driven, always calls his wife or daughter, and in business matters he is generally ruled by them. Thus in Siam, where the differences of rank are so marked, the "equality of the sexes" is almost a reality, and the women may be said to be the rulers as well as the workers.

In a few hours we were in the silence of the great plain, which lay napping under the burning sun, to awake in the cool breezy evening into a low murmur of life.

Stand upon the top of the high palm-fringed bank of one of these great cross-country waterways, and in the gentle evening light look round over the now yellow paddy country stretching far to the horizon: or to some straight, high bank of green marking another dyke, where the tall brown lug-sails are creeping slowly against the sky; or to the east to the far line of trees on the Meinam banks. If ever you have been below Baitsbite lock or to Denver sluice, you will feel the same charm now upon you as you did in those early boating days in the broad fenland.

The paddy land often gives place to neat Chinese gardens of banana, sugar-cane, betel, and pepper, planted in long parallel lines between their irrigation ditches, or to wide stretches of low swamp undrained, and unclaimed except by the buffalo and the heron—great lakes of water where—

"The long ripple washing in the reeds,"

the sigh of the south-westerly wind, and the chirp of the crickets, are all you hear for hours at a time.

Near their cultivation are the villages, usually along the high banks of a klong (or canal), looking, many of them, far from prosperous, and in September and October, when the floods are out, these are the only things above the great surrounding waste of water. Those who own ponies drive them up into a stable on 8-feet piles, where they wait till the water goes down; and even the buffaloes get more bathing than they want.

In one tide a boat usually reaches the Tachin river, one of the mouths of the Meinam, by using the flood to the point where the tides meet, and then going on with the ebb. Siamese will readily "chow" twenty-four hours at a time if put to it, with only a stop or two for a bathe in the heat of the day, and time to eat their rice.

These water highways, the only means of communication Siam has got, and representing an enormous expenditure of well-spent time and money, are many of them being allowed to silt up. The consequence is, that for many miles boats have very heavy work getting through the

IN THE RAINS.

mud and reeds, and are often delayed for hours or days, while launches find them impassable, except in the flood season. The boat traffic coming from the thick populations along the Tachin and Meklong rivers is so great that a light toll levied on every boat would pay over and over for the comparatively unimportant dredging operations necessary to keep the main east and west klongs open. With these klongs properly dredged and policed, Siam could boast as fine lines of communication round her capital as Holland itself; such railways as that proposed to Pechaburi (south of Ratburi) would be of no present advantage to the country. Railways and roads are wanted in Siam where boats cannot go; for wherever a boat will float, no Siamese will go by any other method.

At Ban Pak Char, a dirty unattractive village on the Tachin river, we had an intimation from the police that we had better wait for the convoy which would go through on the flood, as the klong was unsafe at night. Unfortunately there was not water enough for us to go on and disprove these calumnies, and we had to wait until 3 a.m., when we started with some forty other craft. Nearing the Meklong, there is a good deal of attap, mango, coconut, sugar, and pepper cultivation; and at noon, passing through very tidy villages, we opened out into the river. A conspicuous landmark is the great Roman Catholic church at the mouth of the klong, and there is quite a large colony of Christians cultivating here. The river-bed is considerably higher than that of the Tachin, and the consequence is there is, especially in the rains, a strong set down the canal into the Tachin, which makes towing westward by steam-launches a profitable undertaking. It is a pretty river, with tall timber on its banks, clear water, and sand bottom; in short, much like the Meinam at Pichit, and unlike the Meinam among the mud deposits of its lower course. Ratburi, to which the influence of the tide is felt, was, in the time of the old regent, a busy place, and the ruins of palaces, villas, and roads witness to its former prosperity and the energy of the regent. At present it is the least attractive of any place I have seen in Siam. Its people are the least enterprising, the least cleanly, and the least well-mannered I have met. Property is notoriously unsafe; and the farmers and country people round are sick at heart, and (a rare thing in Siamese) grumbling loudly.

We had ample opportunity to look about, being delayed some days waiting for ox-carts for transport. These carts are different to the northern ones, and more roughly put together. They have no hood, and the floor is surrounded by a high rail extending far out fore and aft, for holding straw for the oxen to eat in the dry, hot weather. Our route lay almost due west over the low watershed into the valley of the Meprachi, which drains from the frontier range northward into the Menam Kuai Noi above Kanburi, from which place to the sea the river is known as Meklong. It is a jungle, called by the Siamese "kok," of small timber of hard woods all the way. In the dry season the grass is burnt up, there is hardly any water, and jungle fires light you at night. They look, with their long rows of flaming tongues seen through the tree-stems, curiously like coke-ovens in the black country. On the north we left some abrupt limestone outliers, from which abundance of lime is burnt in kilns by the river-side. Behind us lay the paddy country and a few villages of Lao people. At night we lay awake listening to the thump of their rice-mills, and—loveliest thing in Siam on a moonlight night—the distant notes of the kan (or khen), reminding us vividly of our old northern camps. But by day, alas! we saw these so-called Lao drunken and noisy, clothed with old European hats and coats, like veritable savages on the verge of the evils of civilization, a pitiable and degenerate relic of the Wiengchan captives.

RATBURI, FROM THE RIVER.

Ere reaching the Meprachi we camped three nights at Ban Nong Sado, Nong Maho, and Utapao, the latter merely small clearings in the jungle. The distance is generally done in two nights. We met a few waggons going down laden with mai rang, a hard wood used for boat-ribs, door-posts, etc. Two can be cut and shaped in a day. The best of the sleepers for the Korat railway are being cut in this and the neighbouring province of Kanburi. The drivers were all in great fear of cattle-lifters, who seem to do an extensive trade between the three provinces of Kanburi, Ratburi, and Pechaburi. At night they invariably place the cattle inside a laager of waggons, and sleep inside, with arms loaded when they have them. The Meprachi runs between high banks clothed with ton takien and ton yang (of the Dipterocarpus family). All the latter within reach of any village are defaced by the pockets cut in the trunk for the accumulation of the dammar oil. We met several gangs going their rounds of the trees, some carrying old kerosene-tins full of the oil, the others ladling it out of the tree pockets. Ere going on, they thrust in a bit of a burning branch to stimulate the flow of oil. They are magnificently proportioned trees, and we passed many of them without a branch for 100 feet, standing gaunt and dead, the result of the process.

We camped a fourth night at Tung Mai Deng, as we arrived too late to reach Prachadee, the head-quarters of the mining. There are a few scattered Karen villages, such as Ban Mai and Suanpung, along the Meprachi, but the largest Karen population is further north. They reminded us very much of some of the Khache (or Kacha) tribes of the Lao states, with their beads, earrings and necklaces, and their gay trimmings. They tie up their long hair, in a red or white turban, into a long kind of horn. It is often a foot or more in length, and generally leans forward. The horn worn by some of the Khache is generally shorter and on one side. It is very like the adornment mentioned by Mr. Baber as the fashion among the Lollos. They cultivate bananas, pineapples, and rice upon their "rai" hill clearings, the clearing and burning for which is done in February and the following months. That is about all the work they ever do, except now and then when they shift their homes, or carry a load upon their backs over to the Tenasserim river. The harness for holding their packs is often very neatly strung together, and consists chiefly of two bent pieces of a hard jungle wood to hook over the shoulders, and a band for the forehead. Beyond a few villages of these people, a Lao or two, and an occasional Siamese who has reasons for avoiding the towns, the country is quite uninhabited. The power they most dread in this world is the temper of a certain Lao damsel well known all over the countryside as Isom. We met her several times, and always the sound of her voice preceded her through the trees, abusing some unhappy forester. In all jungle arts she was an adept; she could put to the rout our readiest wits, even Master Star himself, and she spared none. She had evidently advanced ideas about her sex, and from her, after she had made careful inquiries of my followers as to my character and position, I had my first offer of marriage one day as our party rested in the shade. She became extremely inquisitive to know to what I objected in her, and when I told her primarily, like most of her sex, her tongue was too powerful, she got up and went off for a day's fishing, and the laugh turned against her. Thus fortunately ended my first love-affair.

Prachadi is merely a little clearing on an open space among the hills, where the valley of Hoay Baw widens out. As its name implies, a small pagoda or two once stood there, of which some piles of stone yet remain—no doubt erected by some poor fellow who, coming out of the dense jungles all round, was overjoyed to see a bit of sky overhead and an open space of ground beneath his feet, and made his vows and built his offering on the spot. Above this begins the alluvial tin deposit, which is also found in all the parallel valleys on the south. The slate rocks which one stumbles on in the stream-beds becomes much altered toward the junction with the granite of the main axial range, to which the tin owes its origin. In places the granite veins may be seen piercing the older rock, but it is very difficult to find a well-exposed section. The tin of the valleys occurs in a blue clay which lies on the clay-slate bed, and is very like some of the karang of Puket. It is full of pebbles and large water-worn boulders of granite, in which may be seen a beautiful variety of combination of the constituent minerals. The karang where proved has been found 4 to 8 feet thick, and gives as good returns as the best of the Puket stuff.

The tin is plentiful, except in places which appear to have been worked over formerly; it is very black and of good quality, and the overburden seldom exceeds 5 feet in thickness—a depth which would delight the souls of Puket miners, who often have to strip 20 and 30 feet. A little gold occurs in some localities with the tin. So far but few men have been employed, and the output has been small. It is hoped that next year a large number of men may be got to work on the "tribute" system. The heaviest expense in working these valleys will be the clearing of the very heavy timber which covers them, and the transport to Ratburi, which is 44 miles off. The road, it is true, is not difficult, except the 7 miles from Prachadi down the course of the Hoay Baw, which is rough for carts and oxen.

The parallel valleys to the southward are hard to get at, but a cart trail could be cut through from Prachadi some 6 miles to the Nam Ron and Hoay Baw Krung, which would not meet with very rough country. At present there are no tracks in that direction but those made by wild elephants, which are very intricate. The men have a wholesome dread of tiger up here, and on the march never think of mentioning the animal by his proper name. It is always "that fellow," "it," or "he," for fear he should be listening. The barking deer (called by the Siamese ikeng), samba (kwang), and gibbons, and jungle, and pea-fowl abound.

It was in March that we pushed on westward with a number of Karen porters, and began ascending to Kao Deng, the frontier ridge, over which every evening massed vast cloud-castles, flashing and growling like heavy artillery. The trail we followed is very rough, and rarely used but by the Karens, or an occasional Burman returning home from the Chantabun gem diggings. They mostly, however, go over further north, either by the Amla route or by the Bongté pass, where the Tavoy Bangkok telegraph line crosses the frontier. The Amla route is much less used than formerly, and is in parts almost impassable. The last-mentioned, on the other hand, offers the advantage of the magnificent road which connects Tavoy with the boundary, and follows the telegraph clearing to that point. On the Siamese side, there is not much to choose between either route.

As we were all well laden, we took two days and a half to reach the river, going, as the plan shows, considerably north up Hoay Wai Noi, until we got into steep valleys, in one of which we cleared a space and camped in profound darkness, with glimpses of sunlight on branches and trees 300 feet above us. There was very little water in the stream, but next day, going up the valley, we suddenly found ourselves climbing on a beautiful crystalline limestone, with a good stream of water splashing down. Granite pebbles were wedged in here and there, and a granitic sand lay in some of the pools. Turning westward, we were on the well-defined frontier ridge at noon, having passed some old workings, which the Karens averred were long, long ago worked for tin—a remarkable thing, if true, in such a terribly inaccessible spot. There were no outcrops to be seen, and we trod over the thick deposit of decaying vegetable matter, which in these forests so hinders the geologist. On the British side, the descent is rather abrupt for several hundred feet, and the easiest way down was, following the practice of the gibbons, to trust principally to one's arms and such branches as came handy. From the number of smashes, it was obvious that for such methods of travel monkey is much in advance of man.

We camped at Ban Tamamuang, a Karen village of four huts in a rai clearing. We had been credibly informed on the other side that it was a large and flourishing settlement, where we could provision ourselves with fowls, etc., for a week. We saw five, which we were told we might shoot (the only way of getting them) for an exorbitant quantity of small change. All the Siamese or British small change the Karen can get goes to his personal adornment, and strung on his neck or round his arm you see the whole of his available capital displayed. From Ban Tamamuang the trail goes along the top of an abrupt east and west ridge, with deep valleys on either side, and similar parallel spurs beyond them, the whole country a wild jumble of wooded hills and deep valleys, still dark and shrouded in the blue morning mists. A steep drop at the end of the ridge landed us on big granite boulders in the bed of Hoay Matang, and some hours down we were on the old clay slate again, with very fair-looking tin gravel in the bed of the stream, which showed up well in washing. All the way we met the charred remains of old Karen houses, and saw the "rai" clearings on the south slopes of the hills—long ago exchanged by the unsettled roving spirits for some new abode.

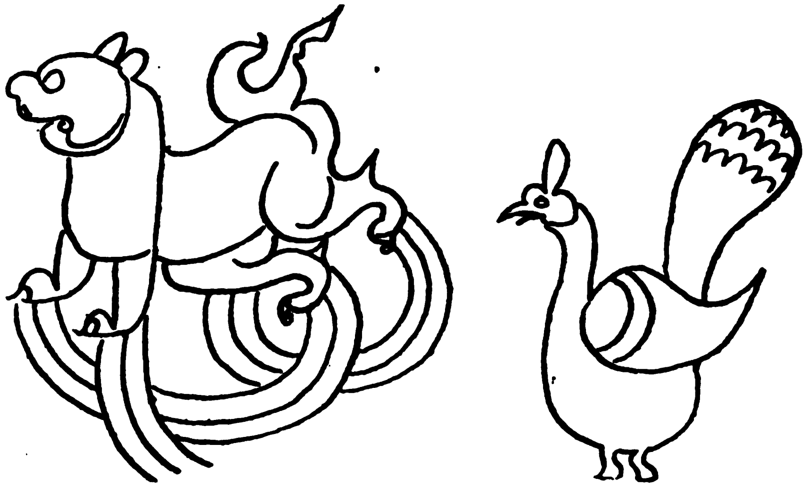
We forded the Tenasserim river, or Menam Amla, as the Siamese call it, thigh-deep opposite Ban Kiu. Once again the wild yarns we had heard on the other side, of populous villages, fleets of boats, and the like, were rapidly dispelled. We found ourselves threatened with a permanent residence at Ban Kiu on starvation diet. There were three households with about twenty inhabitants, and one fowl, half a buffalo, and two dogs per head, both the latter being our inveterate enemies. There was one boat for the whole population, and there was no way through the jungle to get on by. The want of boats is, say the Karens, one result of the tax for felling certain timbers (especially the mai takien) imposed by the Forest Department, which makes it scarcely worth while to cut down one of these huge trees, which may after all have flaws in it making it unsuitable for a boat. To make a long story short, I took the one boat; with a Karen at each end as crew, and with Yen the Contemplative as cook and first lieutenant, I left Master Cheerful in charge, and went three days up river to gather boats for the party.

It would have been a perfect trip but for the heat, which was very great. The wildness of the river exceeds even that of the Nam Oo, of which it reminded us; but the quantity of water is much less, and at that time of year it was hard work dragging the boat over the shallow shingle rapids. Game is plentiful, and without going out of our way we saw seven samba, and secured two, which were cut into steaks and smoked over the fires all night, and thus lasted us for weeks. Wild buffalo, the animal the Karen most dreads meeting, is fairly common, to judge by his tracks. We saw rhinoceros, boar, and tiger tracks, and we often heard several barking deer at once. Jungle fowl, peacocks in pairs and flocks, the great cormorant, always fishing solitary, "nok poot," and the great egret and other herons, we constantly came upon as we rounded a baking ledge of rock or a blistering sandbank,

OUR BOATS ON THE TENASSERIM RIVER.

and now and then a merry colony of otters at sunset. But what astonished us most was the number of the great hornbills. In one flock, as they flapped their slow way to roost, I counted fifty-six, and in another twenty-five. They were so common that their dismal croak and noisy flight became almost irritating.

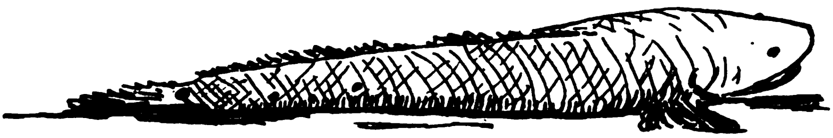
In beautiful contrast are the sweet and often melancholy jungle cries at night, which are best heard on the banks of a great river, and used to be so impressive on the Mekong. The most wonderful of them, to my mind, is the cry of a hawk (I believe), called by the Malays "burong chang," the proper name of which I do not know. It has a true musical pathos in it, which no man can describe, and must have listened to lying awake alone upon the sands to understand. Below Amla we journeyed through a sheet of granite country, and above into red sandstone rocks, dipping to the south-east, and passing into a rough conglomerate further north. All these slates, grits, conglomerates, and sandstones upon the edges of the granite are, however, much distorted, and their succession is very difficult to follow.



Tiger. Peacock.

TATTOO DESIGNS DRAWN BY A KAREN.

The scenery from the boat is beautiful, the hills rising abruptly out of the deep still reaches in many places to a height of 1000 feet, covered with fine timber. In these reaches we paddled along the edges, now and then getting a shot at a jungle fowl. Our bow man whipped the surface with a bamboo rod and a green leaf on his hook in a most scientific manner; indeed, he threw very well, over and over again placing his leaf right over the nose of a big fish, with the result of a splendid struggle. The largest we got was a pla lon, as the Siamese call it, 3 feet 6 inches long from nose to tail; but he was shot as he lay below a rapid. After three days' balancing in our narrow round-bottomed dug-out, more difficult to sit in than the crankiest funny ever seen on the Cam, we passed a small Siamese settlement, and reached Lak Chan Puek, a small village on the great frontier road, consisting of four or five households. From here I sent away enough boats to bring up our party, and spent a week in tramping the country round for game and in cultivating the society of the place. Yan Kung, a tall Burman, was popularly regarded as the chief person, but in all matters of state he was entirely ruled by his wife, who was a Siamese, and possessed in full that capacity for talking which has made her countrywomen such a power in their own land. But she had, too, their kind heart, and could never make enough of us. She had a certain knowledge of the Farang and his ways, which prompted her to bring a pan of warm milk to the sala every morning, a proceeding which raised her much in my esteem. Another important character was Sân, a Mon (or Peguan), whose calling in life was to make the silver chains and bracelets in which fond Karen mothers deck their infants to keep out uncanny spirits. His wife was a burly body of unusual activity, who pounded the rice, beat the dogs, and smacked the children (a fine family of all ages up to nineteen) from before sunrise to after sunset.



PLA LON.

The number of children in the place was tremendous, but I soon found they were mostly the survivors of families who had come over from Siam. Their mothers and fathers long since dead of fever, which seems to be very fatal to them when they settle in a new place, they themselves had been adopted into families which could find food and use for them. One typical story was that told me by a small Siamese known as Toto, who came over with his father, mother, and small brother three years ago. The two former died within a month, and the small brother, when out a few months ago, was bitten by a snake. They generally talk so unconcernedly of death, that we were surprised to see Toto begin to blubber at this point, and all the other small boys joined out of sympathy. "He was two soks high, and I loved him very much," he sniffed, as he climbed hastily out down the ladder. The body-guard, as we called the crowd of twelve-year-old creatures that invariably accompanied him, followed too, also out of sympathy. Each one of these veterans possesses, as his stand of arms, a heavy jungle knife, of which he is intensely proud; and each has his daily work cut out for him—to guard the oxen as they feed in the jungle, to help the women drying tobacco, or, if he be older, to help clearing rai or go fishing-expeditions. Not a few had their tiger yarns to spin, and they did it eloquently, too, in brief expressive sentences, and with the gesticulation of which even children among the Siamese are often masters.

Yen, who is a good sportsman when sailing or shooting rapids, or in other pursuits which appertain not to killing live creatures, for which he is too good and gentle a Buddhist, used to get some of these bloodthirsty huntsmen to do the killing necessary for our chicken curry. Besides being executioners, they constituted themselves our guards at night and our shikaris by day; and altogether we have little cause to forget that hospitable little jungle colony. What struck one was the total absence of malice among themselves, with the result that one never heard any scandal or gossip. The conversation chiefly ran on the last fishing journey, the character of the year's rice, the quality of somebody's oxen, old dacoit yarns (many of them gruesome enough), experiences of travel down to Tavoy or the Malay peninsula, and reminiscences of Englishmen and their guns. The last invariably brought on a discussion as to why Government won't allow them firearms, for which they have a keen appreciation. They usually manage to get at the bright side of things, and so it would end with the verdict, "It is better to have no guns and no robbers, than having our guns to be in perpetual fear of our lives and property." Still, the boldness of tigers and leopards round these forest settlements, which bears hard on them in loss of cattle, etc., is owing to the impossibility of hunting them down sufficiently with no arms but jungle knives.

The Karens about the frontier-line all talk Siamese and Burmese as well as Karen; they are constantly moving from one side to the other, but there are far larger numbers settled in the Tenasserim valley than on the Siamese side. Timidity of strangers and love of loneliness seem to be their chief characteristics; they prefer to build their hut and cut their rai a day's march from their neighbour, if they can, to being among a cluster of houses. They say, "We do not like to see many houses. Had we to live in a town, our hearts would be heavy; we should die." And thus year after year the family goes clearing its way further into the wilderness, paying extraordinary reverence to the sights and sounds they meet, each one of which to them portends some degree of luck or the contrary.

When the boats came up, we started on our march down to Tavoy, our gear and invalids (we had generally two or so down with fever) going in the boats on the river below. I found it impossible to go down river to Tenasserim as I had wished, as the Karens absolutely refused to go, and seemed to have a great terror of the lower river; so there was nothing for it but to go up, by Myitta and Tavoy. And a most luxurious march it proved, notwithstanding the heat, with all the beauties of mountainous jungle country and none of its drawbacks. A fine road to go upon, following easy gradients, showing us wonderful scenes (which one generally has to do without in these forests), and we had the assurance of a roof overhead and a floor underfoot at the end of the day. In fact, we were all much impressed with the comforts of travel in British territory, with comfortable Public-Works-Department bungalows or shady salas every 5 or 6 miles.

A View of the Line.

Our morning marches, when the wet mists lay thick about us, were enlivened by rather clever extemporary "clown scenes"—such as they act in Siam—between Master Cheerful and Master Star. Question follows question, and the fellow acting jester has to reply as wittily as he can right off without hesitation. The style is rather that of the circus at home, when the horse-trainer asks conundrums of the clown, only the Siamese is all extemporary. Master Cheerful is a genius at this form of amusement, as he is at others, and on these occasions he thoroughly bore out his name, and kept the hillsides echoing with laughter.

The first day we went 20 miles, and got some wild honey for supper, the Karens cooking the comb; bees are, in fact, over-plentiful and over-familiar, alighting all over one. The scenery is quite imposing; the hills above point after point are generally thickly timbered, but stand in places bare fire-swept peaks. We reached Boa Chon in two days more. We found here a plum-tree, the fruit of which stewed down is very like damson. We had a serious alarm that night, in the middle of a lesson in Burmese. In rushed the Karens with frightened looks and the horrifying intelligence that the moon was being eaten. Every one, with great presence of mind, rushed to the nearest pan he could lay hands on, and began to beat and thrash it heroically; the result became a frightful din that awakened all the jungle fowl for miles around, and they joined the chorus. Still the moon undoubtedly got smaller and smaller. As a last resource, the head Karen begged me for a rifle, and commenced "independent firing at 220,346,080 yards" (or thereabouts), with such satisfactory results that (although I had hardly expected the weapon would carry so far) the dragon was compelled to retire, and the fame of my rifle spread in the land. I regret to add that Master Cheerful alone declared it was no dragon, and that my rifle had nothing to do with the result. The intelligent reader will understand from all this that we observed a partial eclipse of the moon on March 21, 1894.

At Myitta, which we reached next day, we found ourselves among a comparatively thick and thriving population of Karen Christians, owning elephants, schools, and chapels. We heard them singing hymns a good deal, but I was told of them that the better Christians were the best idlers. We soon found, however, that there were ideas of discipline among them, for, though we arrived late in the afternoon, we had ten elephants ready loaded by 4 a.m. next morning. We did 27 miles that day, downhill most of the time to Pagaye, very few feet above sea-level, and only 11 miles from Tavoy, which we reached next morning across the thirsty plain.

Though in well-known country, I cannot but refer to the last two days' march, leaving Nwalabo and its ranges towering in mists above us, and descending from the heavy timbered forests to the more gnarled and twisted woods on the last granite spur at Wah Gon, and finally to paddy and palm growing zone about Tavoy. We met a large number of Siamese-speaking Burmans, Tailings (or Mons), and Karens, most of them having been into Siam at some time or other on some trading venture—to sell iron files and knives, to buy elephants at Singora, or dig gems at Chantabun—and they were most hospitable fellows, getting us in for a chat whenever they could. The Siamese were much impressed with the size and power of the humped oxen; and the carts of the flat country fairly astonished us all, for we had never in Siam dreamt of carts of such carrying capacity—for the simple reason that there are no roads for them to go upon.

THE TENASSERIM RIVER ON THE FRONTIER ROAD.

Our lowest and highest readings of the thermometer were at Prachadi, on the same day early in March, where we had 55° Fahr. at sunrise, and 97° in the shade at 2 p.m. The average temperature in the mornings there was 61°, and the average maximum 90°. A month earlier it would have been much colder. The cooler the morning, the higher the reading later in the day in the winter months. The middle of March gets warmer, and the temperature at night is seldom below 70° in the hills, and 80° in the lowlands. Toward the end of that month the warmth is often tempered by tremendous thunderstorms, and in one hour the thermometer will fall 20°, and the damp air, suddenly cooled to 73°, feels very chilly. One such storm at Lak Chan Puek began with a tremendous shower of big hailstones, the thermometer at 93° Fahr. The contemplative Yen appeared completely fascinated, and after studying and (like a truly scientific investigator) tasting and finally eating the phenomenon for some time in silence, he commenced a close examination of the subject of meteorology, with the results of which he occasionally startles me to this day. The only thing which drove the hailstones out of his head was our arrival in Tavoy, from which place his parents originally came, and the language of which he knew as well as his adopted tongue of Siam.

From Captain Cronin, the deputy commissioner here, and from Mr. Batten subsequently at Mergui, I received the greatest kindness and hospitality, as well as much interesting information. I know few things in life that give greater pleasure than the hearty welcome and the refreshing conversation with which Englishmen, thus stationed on the outposts of civilization, greet you, when you march in upon them unexpectedly straight from the deep-jungle life.

II. Tenasserim and Trade Routes.

From Tavoy we reached Mergui * by the B.I. ss. *Camilla.* It is one of the prettiest of little seaside towns, the thatched roofs climbing the hill to the pagoda at the summit amid a luxuriance of vegetation, which showed plainly that we were now in Malaya, in strong contrast to the more truly Burmese scenery of Tavoy. The flora and fauna of Mergui partake of those of both; it forms a neutral zone where both flourish; but its Malay character is perhaps the more pronounced, and the flowering trees and shrubs, and the mango, mangostine, coconut, pineapple, jack-fruit, and durian thrive as they only know how in Malaya.

The province has a few very self-contained Malay villages, Karens, Siamese, Burmans, and last, but more energetic than all the others put together, Chinese. As elsewhere, the Chinamen, with a few natives of India, do the trade, and cause the trouble. It is essentially not a rice-growing province, but exports, as might be expected, large quantities of fish and fruit, dammar torches, dried shark-skins, and edible birds'-nests—the latter chiefly from the Canister and St. Andrew's groups; they go to the straits, and they go into the Shân states usually by the Yunnanese caravans from Mulmen. They invariably come from the isolated limestones of Lower Carboniferous age, of which the extensive remains form so peculiar a feature of the scenery of both sides of the peninsula, as far north as Moulmen, and apparently as far south as Perak, which appear in the Lao states upon the Mekong, on the Nam Oo, and even in Tongking and Yunnan.

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* Siamese name, Muang Melit.

One of the most striking peculiarities of Mergui are its boats, which differ completely from either Chinese or Siamese design. The form of hull is best described by a sketch. The rudder, which is hoisted as she lies on the mud, is lowered when under way until it draws 3 to 4 feet of water. The boat is long and narrow, with a V-like section, built upwards from the lower solid floor by strakes fitted inside one another, a riband being run round outside the joints. They are rigged with two slender pole masts, one right in the eyes with a slight rake forward, and one amidships, and they set two light square-headed lugs as near as possible the same size. They are generally indifferently ballasted and caulked, and, having very little initial stability, they are sailed as upright as possible, a moderate list proving dangerous, as I found once in a squall, when with a very moderate heel we found ourselves taking in water so fast that we had to strike all sail. There is usually a small shelter abaft the mainmast; but otherwise there is hardly a dry place, as the deck is not made to keep out water.

MERGUI BAY, FROM THE HILL.

The fishing craft are generally lighter and narrower still, being simply dug-outs without additional structure. They have no shelter, but a thatch to place on the nets before the mainmast. They are quite round-bottomed, and to see them streaking through a tide lop off the wind, or running up a mud flat at low water, with both sails drawing full, is a wonderful sight. To windward they are not satisfactory, having so little hold on the water, and their crews, who manage them deftly, yet have to trust a good deal to ground-tackle and a sheltering islet when it blows hard. But, with the beauty of their snake-like shape, and the variety of red in their sails, they make lovely pictures to a sailor's eye.

I was struck in Mergui by the amount of corrugated iron and iron castings used by the Burmese in their shrines for roofing, railings, and scrollwork. They find the material cheap and lasting; but it must be owned that from an artistic point of view, that from which one cannot help regarding all architectural effort, the prevalence of its use is deplorable. Iron is a very poor substitute for the beautiful wood carving for which the Burmese were justly renowned of old, and surely it marks a downward course in their ideas of beauty.

During our stay we made a three days' trip up to Tenasserim (Siamese, *Tenusi* or *Tenu*), which stands on a small plain at the junction of the Great with the Little Tenasserim river flowing in from the southward. The line of the old walls can still be seen, with the remains of several old Siamese-built wats or monasteries, among them Wat cheng (Wat Chang), built in 1380. The population consists of a few hundred Burmans, and scattered through the country round, Karens and Siamese.

Except for the extensive jungle clearings where the big timber has not yet grown up again, which are obviously the work of a formerly thick population, there are no signs of the early importance of Tenasserim and its seaport Mergui when under the Siamese. It is a rare thing, where British rule has had so many years to make its influence felt as is the case in the Tenasserim provinces, to see so small a population and so little material prosperity.

The primary cause of the ruin and depopulation of the west coast was the merciless conquest of Alaungphra in the last century. Subsequently fell the Siamese capital of Ayuthia, to which Mergui and Tenasserim had been the chief starting-points of the overland route from the west. That they have never recovered their position is due in part to the growth of English power in the straits, which has created the trade of Singapore and Penang, and has suppressed the piracy which was once rife in those waters; and in part to the development of steam navigation, which has robbed the overland routes of the peninsula of their value. These routes have been so neglected as to be scarcely known except by the Burmans, Karens, or Siamese living in the hills, who still occasionally use them. Of the supposed carriage road nothing is known, and I suspect it was never more than an ordinary cart trail. That ox-carts were used for a part of the journey is, we know, a fact, but in Siam these carts travel in all except the roughest hill country, and they are quite independent of roads as we understand the term.

Of the three old main routes from Mergui, the northern went up the great Tenasserim by boat to Jelinga, which was apparently on Klong Sarawa, and thence over the watershed into the valley of the Menam Phipri, north-east down to the town of that name—which, by the descriptions of its importance, must be the present Pechaburi.

A second route from Jelinga, more to the southward, went down the valley of Klong Pran to the coast town, Muang Pran, probably the present Pran.

A third route from Jelinga went to a place variously called Queal, Couil, and Kiu, supposed to have been on the Phipri or Pechaburi river. I take it, however, that the Couir passed by Bishop Bérythe was the same, and that it is the modern Muang Kuei or Kuwi, to the south of Muang Pran.

It must be remembered that the hill trails invariably follow up and down the valleys of streams, where the gradients are easier, and the map shows that, crossing from Klong Sarawa, one may descend one of the three main lines of drainage, Menam Pechaburi, Klong Pran, or Klong Kuwi.

If there were no boats on getting to the coast, a party would follow along the main north and south trail, which is at present used a good deal, through Muang Pran, whence the bishop took five days to Pechaburi. He travelled very slowly, for he took four weeks between Jelinga and Pechaburi, while the average time for lightly equipped parties used to be ten to sixteen days from Tenasserim to Ayuthia. To take such a time he must have dawdled unconscionably, or else have gone a roundabout way; and it is quite possible he went up the Klong Sarawa to its source, round the shoulder of Kao Hlewada and down to Kuwi, where they expected to get boats. Such roundabouts are often necessary in jungle travelling when other routes, as frequently happens, are temporarily blocked by fallen trees or landslips.

I am the more inclined to think that Queal, Couil, Kiu, Couir, Kuei, and Kuwi are the same, and that in Dr. Anderson's map Kiu is placed too far north, as he speaks of "Kiu, where these mountains (Sam roiyat) approach the sea." Now, the Sam roiyat are a well-known landmark to Siamese fishermen, and lie in 12° 13′ just to the north, and within sight of Muang Kuei, or Kuwi. They are not, as Harris says, a portion of the main mountain range, but are a geographically and geologically distinct mass of limestone peaks; and the track from Kuei, or Kuwi to Pran passes west of Sam roiyat on the low country between them and the hills of the axial range. Again, Kiu is mentioned as 140 miles from Bangkok, almost the exact distance of Kuei, or Kuwi; and, in reference to Harris's voyage, mention is made of the custom of watering vessels at Sam roiyat or Kiu, especially when bound eastward to China and Cochin China. This custom has lasted to the present time, and twenty years ago, before regular lines of steamers were trading with Bangkok, the large four and five masted junks used to warp with great grass hawsers the whole way to Sam roiyat, or Kiu, water there, and having thus made a long leg to windward, they could weather Cape Liant, and look well up for Cambodia point on one tack with the prevalent south-westerly wind, and thus avoided the difficulty of beating out of the narrow inner gulf.

The coast boats and small Cochin China craft still beat down along the coast to Sam roiyat, and Muang Kuwi, until they can make a long leg off the shore, and fetch their port on the opposite coast; and many a red prayer-paper is offered off those headlands, as the little craft comes round, and sheets are trimmed for the long reach seaward.

A fourth route was overland from Mergui across the Tenasserim river at Jelinga, and down to a place called Xam on the coast, said to be south (?) of Kiu. I am not aware of any name answering to Xam at the present time.

Further south a fifth trail crosses the low pass of Kao Maun, lat. 11° 49', where the Siamese territory is narrowed down to some 15 miles by the approach of the mountains to the shore of the gulf. The route went up the valley of the Little Tenasserim and Klong Tin Kuan in a general south-easterly direction, over the pass, and down to Bang Narom in 11° 50'. There are some good boat harbours at that point, inside Ko Luem and Ko Lak. Mr. Leal, who went over by this route from Siam in 1826, says that on the second day they reached a point where the road branched off in two directions, the right leading to Bangtaphan, and the left to Mergui. This, as Bangtaphan is some marches southward, must be a mistake, and the left must have been the road to Bangtaphan, and the right to Mergui. In the same way, below he says one road led east to Mergui, an obvious mistake for west.

A further possible route, followed recently by Dr. Keith, is up the Little Tenasserim to its source, and down by the valley of Bangtaphan. More south, again, a track crosses the frontier range from the Lenya river in 10° 59' to Chumpon. It is a good example of the way the trails follow the natural lines of drainage. The most southern of the trans-peninsula roads which has any connection with the Tenasserim provinces is the well-known one from Kra to Chumpon, a trail coming into Kra from the upper waters of the Lenya river northward.

While on the subject, it may be noticed that the old main routes from the Bay of Bengal to the Gulf of Siam, across the Siamese Malay states, mentioned by Crawford and others, are still much frequented by Siamese and Malays for purposes of local trade. The most southerly is from Keda to Patani; and another from Keda to Songkla (or Singora) is on the line of the proposed railway, now just begun. Further north Trang is connected through Kontani (Captain Low's Khoan Tani) by a track which crosses at a very low elevation above sea-level with Ligor and Lakon. A fourth crosses from Paklao, a village lying abreast of Ponga in the north-east corner of the Junk Ceylon bight, into the valley of the Bandon river, and to Chaya; but I need hardly say that the tin trade from Tongka mentioned by Harris has left that route in favour of the straits. From Paklao there is also a rarely used trail going more nearly due east to Lakon.

There is a more northerly route from Takuapa eastward into the Bandon valley, and above that a track connects Renong and Lang Suan.

The general direction of these routes will be seen to be considerably north of east. They are not likely to become neglected, as has been the case on the Tenasserim frontier, from the fact that the states on the east coast of the peninsula are completely shut up by bad weather the whole of the north-east monsoon season, and the only way out of them is thus across the country to the west coast. The north-east monsoon, which means fine weather under the lee of the peninsula, means in the Gulf of Siam strong on-shore gales and heavy rain, and a tremendous sea prevails upon the peninsula east coast. As there are few harbours, and what there are are generally in the mouths of shallow rivers protected by bars of sand, the boats are laid up, and navigation is practically suspended in that season, as in the south-west monsoon it is on the west coast.

The strength of the monsoon on the eastern coast would have to be reckoned with in carrying out any Isthmus of Kra canal scheme, for Chumpon Bay is fully exposed to the north-east sea, which rolls in heavily on the shallow soundings. Tremendous harbour-works and very expensive dredging would have to be resorted to to enable vessels to enter and leave the port. The shoals in the bay are continually shoaling up, and the bar of the river alters from year to year.

An alternative might be found to the southward in Sawi Bay, a large shallow-water indentation, and it is possible that the Laun river might give better access to it from the Pakchan than Kra higher up. To admit big ships, heavy work would have to be undertaken on the 2, 1, and ¾ fathom patches, which lie outside the Pakchan; and when all was done, it may be doubted how far would vessels choose this route, with the bad weather and intricate navigation to be encountered on one side or the other, in preference to the straits.

(*To be continued.*)

NOTE ON MR. WARINGTON SMYTH'S MAP.—The map of the chief passes from Siam into Tavoi is based on Lieut. Bagge's map, with additions by Mr. Warington Smyth. The trade routes shown on the smaller map have been taken from a sketch-map made by author.

THE WESTERN SIERRA MADRE OF MEXICO.*

By O. H. HOWARTH.

It is a common remark that there is a family likeness between all mountain ranges. In a general sense, it would be strange if it were not so, if one considers how comparatively few and essential are the prime causes which co-operate in mountain-building. Were we to eliminate the results of slow variations of strain or compression, sudden or chronic eruption, and the external erosion of yielding materials, the surface of a planet might conceivably remain changeless for indefinite ages. Yet to the eye of a student of mountain structure it may be said that there are at least not fewer variations upon fundamental types than in the human family itself. A European, for instance, may not readily discriminate between the families of a Mongolian race, or between the individuals of a Zulu or an Esquimaux family. Yet we know that such distinctions are merely a matter of habitual practice and opportunity for frequent and close observation. The same applies to mountain structure.

I propose to notice a few such features of family likeness—as well as of family unlikeness—observed within the past six years, while traversing the western ranges of the North American continent at various points extending over almost their entire length from Oregon to Guatamala, but with especial reference to their less-known developments in the western Sierra Madre of Mexico.

I must refer but briefly, and only by way of comparison, to the scenes and characteristics of the grand ranges of the north—the Siskiyus and the Cascade Range, the Sierra Nevada and the Rockies proper, and the vast and complex ramifications of New Mexico and Arizona, and of Upper and Lower California—fascinating as all these are in a thousand aspects, and as yet by no means so thoroughly explored as may be supposed.

While the general ranges of the Great West, from Alaska to the Mexican frontier, are interrupted and divergent to a greater degree than is yet indicated on any comprehensive map, there is, nevertheless, no interval which actually breaks the continuity of the enormous rib of high elevation dividing the Pacific slope from the central plains of the North American continent. The general altitude of 13,000 to 15,000 feet attained by the highest summits is characteristic of the whole ridge, though the frequency of such heights is less noticeable than in some other ranges, such, for example, as the Great Atlas and the Caucasus. The general conformation of the ranges north of the thirty-second parallel—that is to say, north of the Mexican frontier—is roughly that of a double parallel ridge, with a depression (still of high altitude) between the main ranges. This high plateau, running from north-north-west to south-south-east, is represented by the plains of Eastern Washington; Eastern Oregon; the Klamath and Malheur Lake districts; nearly the whole of Idaho and Utah, including the basin of the Great Salt Lake; and the plateau of North Arizona, intersected in places to a vertical depth of more than a mile by the Grand Cañon of the Colorado.

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* Paper read at the Royal Geographical Society, June 24, 1895.

This dividing plateau gradually descends southward until it terminates, so far as elevation is concerned, at the head of the Californian gulf; but the two main parallel ridges are still represented as far south as the Tropic of Cancer by the peninsula of Lower California and the Mexican Sierra Madre—the latter continuing southward without a break to the extreme limit of Mexican territory, and beyond it to the narrowing of the continent at Panama. The Sierra Nevada is continuous into Southern California, where the designation of Sierra Madre first appears; and the Rocky Mountains through New Mexico into Chihuahua and Sonora, and thence between the Mexican states of Sinaloa and Durango, Michoacan, and Guerrero, and the other western states, where it bears the same name throughout.

The unbroken continuity of the Sierra Madre for nearly 2000 miles of length, and from 200 to 300 miles of width, makes it, in fact, one of the largest compact mountain areas of the world. Excepting the great volcanic peaks of Popocatapetl and Ixtaccihuatl to the south-east of Mexico city (which attain an altitude of over 18,000 feet), it is not distinguished by many points of exceptional elevation, but rather by the remarkably uniform altitude of the central ridge, which maintains its height of 11,000 to 13,000 feet for several hundred miles with little interruption. The result of this, geologically, seems to have been a thicker and more uniform deposition of certain tertiary formations; and these, having been subjected to the more uncertain and intermittent erosion of tropical weather, are the cause of a marked distinction in the scenery from that of the northern ranges. While the comparatively isolated summits of the Rockies—such as Mount Hood, Mount Shasta, Long's peak, Pike's peak, and the Spanish peaks—impress and delight the observer with their vastness, the Sierra Madre abounds more in scenic surprises, and the constantly varying charm of the unexpected.

Travelling, for example, through the central ranges of Sonora (the north-western state of Mexico), one may traverse a group of high dome-topped hills, beautifully studded with dwarf pine or mountain oak, and clothed with long grasses—the home of the antelope, the white-tailed deer, and the wild turkey—and with scarcely any characteristics of the main range. In another mile these may be suddenly cut off by some huge chasm surrounded by towering crags and steep water-torn gullies, perhaps sectioned out at their bases by remains of the curious terraced gardens constructed in past ages by a human generation now extinct and untraceable. Then may follow a glimpse of the main range crowned with its pine and cypress forests, and possibly streaked here and there with snow. At high altitudes throughout this range occur also the singular and charming level plots called the Llanos, and known in the Rocky Mountain range as "natural parks." These are frequently seen at a "parting of the waters," where an infant stream creeps quietly through the deep alluvial soil, and nourishes the meadow-like expanse surrounding it. Groups of stately trees are dotted over the tract, more varied in kind under the genial Mexican sun than further north, and the atmosphere and surroundings inspire an almost indescribable wish to seclude one's self in such a home as the spot suggests. Within another hour or two of mule-riding, all this may have given place to a series of precipitous heights, wild, ragged, and nearly bare of foliage, excepting cactus and mesquite; and topped, it may be, by some strangely jutting dyke of quartzite, carrying its hundred or two hundred ounces of silver to the ton. Going further south into Chihuahua, where the ranges of porphyritic cliffs are still loftier and wilder, features of exceptional interest will seldom fail to present themselves within the space of a day's ride. Here may be found at intervals the most fantastic forms of weathered "chimney stacks," or turrets, of decomposing gneissic granite, or castellated ridges recalling many others on the course of the Green River and the Colorado. Here one may see, on a steep declivity of forest soil, a huge trench scored out by the fall of one of those immense meteorites which so curiously seem to have made choice of Mexican territory as their resting place on our planet. Here also, amongst the fastnesses of the highest ridge, not many miles from the mining camp of Pinos Altos, has been found a cascade which may probably—though I cannot venture to certify the fact—claim the distinction of being the highest vertical waterfall in the world. The volume of water passing over it in the rainy season is often considerable, and an actual measurement from the ledge showed a clear perpendicular drop of 948 feet before the water touches rock again.

Owing to the large proportion of mountainous country which occupies its area, Mexico is not a land of great rivers; and even its perennial streams are comparatively few, the rainfall taking place wholly between the months of June and September, except at certain high levels, where the "equipate," or winter showers, occur in January. This, however, applies only so far north as the line where the summer rains, characteristic of the tropics, commence. That line approximately cuts off the northern states of Chihuahua and Coahuila, which are for the most part extremely dry, and represent an intermediate zone between the tropical region and the Californian climate where rains occur in the winter, and irregularly at other seasons. The permanent streams flowing west from the Sierra Madre have generally direct and short courses, not exceeding 60 to 80 miles, and are, of course, subject to high flood during the wet season. The natural storage reservoirs are also few in number, but those few comprise a lake district almost unsurpassed in the world in respect of its scenery, climate, and general interest. In the heart of the Sierra Madre country lie the magnificent lakes of Chapala in Jalisco, and Cuitzeo and Patzcuaro in Michoacan: the first a body of fresh water 60 miles in length by 20 in width; the other two about half that size, and distinguished by every feature of natural charm conceivable. Yet the population of this singularly attractive region still remains extremely sparse, its wonderful fertility being only availed of here and there by the poorest race of peasant farmers, and a few growers of maize and coffee. On one of the islands in the Lake of Cuitzeo, a small independent tribe of peaceable Indians have been established from time immemorial, with customs, language, and physical characteristics distinct from others in the same state. To which of the three great races of antiquity—Aztec, Toltec, or Acolhua—these were allied is unknown.

It may be of interest to note here the appearance—or, as regards Mexico, I should perhaps say, the doubtful appearance—of indications of glacial action. I have not, from personal observation, become acquainted with any instances in the Sierra Madre, though by no means prepared to say that they do not exist. But the conditions above mentioned relating to the structure and probable tertiary history of the range, do not suggest the occurrence of glacial signs as likely. There is no question, however, that the operation of ice-flow is traceable in New Mexico and Colorado at several points on the southern branches of the Rocky Mountains, where neither the latitude nor the elevation would lead one to seek it. My attention has been drawn quite recently to a number of remarkable examples of the "glacial mill"—the peculiar bowl-shaped hollow excavated in granitic or other rock by the grinding action of a captured boulder in the sub-glacial stream. One such instance I found last summer on the very summit of a granite mountain in the Estes park in Colorado, at an altitude under 9000 feet, and in a position entirely isolated from the surrounding ranges. The tale told by a single case such as this is of the highest interest to the geologist, and should prompt every observer to note the occurrence of similar signs at any points in the southern extension of the range. The district of chief interest to examine with this view would, in my opinion, be the north section of the western Sierra Madre down to the latitude of the Tropic of Cancer, abreast of the end of the Lower California peninsula.

The effects of climate and water in the higher altitudes of the Sierra Madre have frequently been extremely singular. In the more siliceous formations of the porphyritic group, where decomposition has proceeded from within, cave formations occur at the most unexpected points. Among many instances, I recall especially an enormous arched cavern observed in the north of Sonora, almost at the summit of an isolated conical peak some 4000 feet in height. But for its unique situation it might have been supposed the work of human design. It was, no doubt, the difficulty of access to such retreats that first led to their occupation by wandering tribes as places of safety and defence.

Eccentricities of rock structure are found in infinite variety—if, indeed, the term "eccentric" can be used where Nature has not bound herself by any prevailing law. Many of these strange forms are due to the inherent character of the range, and occur at points where an immense compression appears to have been exerted within a very limited area, and upon material which was probably of an unyielding nature throughout the period when the compression occurred. The solvent action of hot water, the local effects of earthquake, and of exceptional torrents in wet seasons, have also taken part in varying degrees in the production of these peculiarities. While travelling through the western outskirts of the range, from the coast regions of Sinaloa, I passed within view of a mountain peak so accurately pyramidal in form that, if on a smaller scale, it would at once have been noted as an artificial structure. The pyramid being so familiar in southern Mexico as the conventional form of pediment for temples and sacrificial buildings in ancient times, I was curious to ascertain whether this natural accident had not suggested the same use on a grand scale, and made careful inquiries of the peasantry as to whether any remains existed on its summit. It was interesting to find that the suggestion of Nature had not escaped the attention of the sun-worshippers. Foundations of walls, and the small circular pits—perhaps receptacles for the blood of victims—were described to me as having been noticed on the summit of this mountain, leaving no doubt that it had once been consecrated to the same purpose.

For several centuries the extraordinary wealth of the Sierras of Mexico in metalliferous veins—and especially those of silver—has been known to the world, although, from a commercial point of view, the actual production of that metal has latterly become a controversial and somewhat depressing topic. But the vast preponderance of one metal in this particular "squeeze" of the Earth's crust is none the less interesting. For the present purpose it would lead us too deeply into a technical study to discuss the features of this mineral storehouse. A few general facts only can be noted, illustrating the peculiarities of its formation.

The fissures of the great silver-veins have usually been formed at points where the movements which gave rise to them have been at once deep-seated and apparently restricted in space. Hence they are generally found in the most inaccessible situations, and amongst rock scenery of the wildest and most chaotic character. Frequently their outcroppings are at the highest elevations; and many a mining camp may be descried amidst the cañons of the Sierra Madre, perched amongst precipices where even the agile mountain mule would hardly be supposed to find a footing. Two singular characteristics of the great "mother-veins" are noticeable throughout the range. The "strike" or course of the main veins is almost invariably from north-east to south-west. So constantly is this the case that many miners would feel little faith in a vein that ran in any other direction. The other peculiarity of the deep-seated veins, usually described by experts as "true-fissure," is their very near approach to a vertical position in the rock containing them, frequently not exceeding 5° to 10° out of the perpendicular. Thus even in early times the workings have penetrated to unusual depths, some of the old mines being down to 1500 or 2000 feet. A visit to such a mine, which has been worked on the Mexican "sistema de rato," or rat's plan—that is to say, burrowing after the vein wherever it leads—is an experience not to be forgotten; nor, if one values one's safety and comfort, to be repeated. I remember such a visit a few years back, when to the general perils and difficulties was added the sudden assault of an immense colony of large bats, disturbed from a disused tunnel, from which they fled in such swarms that torches were knocked out, hats brushed off, and the floor of the tunnel, as we returned, cushioned with the bodies of those which had fallen. The naturalist may be puzzled to say by what means these creatures discovered their extraordinary retreat, and how they contrived, evening after evening, to find their way to the upper air by a corkscrew shaft over 300 feet deep, and covered at the top by a wooden shed.

It is scarcely necessary to remark that the ores of silver do not, as a rule, present themselves in a form attractive to the eye, and that the interior of a silver mine is as far as possible from being the fairy palace the name may seem to suggest. Occasionally, however, the bunches of native silver which occur exceptionally in the "wire" or "needle" form are of great beauty, and solid nuggets, though rare, are not unknown. One mine in Chihuahua produced from a globular cavity a solid silver ball weighing 445 lbs., in which scarcely any foreign matter was present. Many of the tales of silver-production which sound more or less fabulous to European ears are undoubtedly quite correct. A single mine has been known to produce the value of a hundred million dollars; and this being a matter of official record at a period when the metal was subject to taxation either by the Church or the municipal governments, or both, the return is far more likely to have been systematically understated than exaggerated. Nor is there any reason to doubt the truth of such stories as that of Pedro Ferreros, a mule-driver of Pachuca, who afterwards became Count of Kegla, taking his title from the name of his mine. On the occasion of the baptism of each of his children, the procession walked from his residence to the church upon a pathway paved with bars of silver.

I was myself acquainted with a miner owning several properties, who possessed in one of his mines a vein of ore containing from 1000 to 1200 ounces of silver per ton. His habit was to bring down from time to time a single sack of this ore, and as often as the ordinary produce of the smelter was turned into the refining furnace, a modicum of this concentrated wealth was added, so as to bring the daily assay up to the point which satisfied him, and assure an unvarying profit from one years' end to another, no matter what the other mines produced.

The most striking peculiarities of rock formation are observed wherever compression has been most severe over a limited area. This, as already noted, is specially frequent in the Sierra Madre, and cases of severe "squeeze" on a grand scale, though they have unmistakable counterparts in the northern ranges, are much more frequent in Mexico, producing the features which are illustrated comparatively in my photographs. This is especially the case in certain parts of Sonora, Durango, Sinaloa, and further south in Oaxaca. But in the presence of recent volcanic activity—as in the neighbourhood of the volcano of Colima, or that of Jorullo in Michoacan—the disturbance has been rapid in action, more superficial, and has given rise to a structure showing less constraint in form, and more resemblance to the spreading ranges of Arizona and New Mexico.

The Sierra Madre possesses many curious instances of the accidental markings on mountain surfaces which from a distance attract the fancy or rouse the superstitions by their resemblance to human or other familiar figures.

The well-known mountain of the Holy Cross in Colorado has more than one replica in Western Mexico; and many a natural seam or trench or jutting dyke has supplied some fanciful name to its locality, from similar resemblances. The most striking instance, by far, which I have yet found in the Sierra Madre is the figure called by the Mexicans La Muerte (Death), on the eastern flanks of the range, overlooking the great Llano, or level plain, of Durango. It is merely a huge scar, or group of bare watercourses on the steep mountain-side. From a certain point of view the resemblance to a gigantic human skeleton—one hand on its hip, the other raised aloft, and one foot lifted in the attitude of a grotesque dance—is so inimitably accurate that one can scarcely wonder at the superstitious awe with which this mountain is regarded. It is hard to feel assured that the figure has not been somewhat trimmed up or finished by human agency, though the situation and its dimensions, in fact, preclude any such possibility.

None of these figures are perhaps more singular in their similitudes than the Queen Eleanor rock below the Twin Sisters mountain in Colorado, or the various fantastic groups of weathered sandstone in the celebrated Garden of the Gods at Manitou. But the Mexican has not yet appreciated the theory of coincidence, nor recognized the fact that amidst the countless freaks of natural sculpture it would be strange indeed if there were not a few that counterfeit other types of form.

At present I am acquainted with only two examples, in the ranges of the Great West, of a columnar structure of igneous rock resembling that of the Giant's Causeway. These appear to have resulted from a peculiar distribution of pressure, or rather, perhaps, to a partial release from pressure where the rock was liable to split in one direction. The two cases are widely remote, one having been observed in a railway cutting in the north of Oregon, and the other on the course of a stream in the state of Jalisco, Mexico. The rock is in each case a basaltic lava. The resemblance is illustrated by the photographs.

The climate of the Sierra Madre includes a large proportion of the "tierra templada," or temperate zone, represented by nearly the whole interior plateau of Mexico, which, though tropical in latitude, can scarcely be so described as to its temperature and products. I have more than once returned from that country to the north of the United States in July or August when the heat was far more severe in Chicago and New York than in any part of the interior of Mexico. The higher altitudes reach the "tierra fria," or cold zone, in which snow lies, more or less, between the months of December and March. The line of perennial snow in Mexico cannot be defined as much below 14,000 feet, and this is apparent only on the highest volcanic peaks mentioned above. On crossing the main ridge of the Sierra Madre between the states of Sinaloa and Durango in March, 1893, I found no snow at 8000 feet, although frosts occurred at night. The heat in the lowlands of the west coast at that season was becoming severe by day, but the nights were still cool; in fact, a hot night is a thing almost unknown in Mexico. Owing to the proximity of the high ranges to the coast-line, and the rapid downflow of cold air, cold mists and even frosts are encountered on the coast in winter at night, while by day the tropical power of the sun is still considerable. The exhilarating nature of the mountain atmosphere in the pine forests above timber-line is a thing not easily forgotten. At no other elevation in Europe, Africa, or America have I ever experienced in the same degree the peculiar sensation that for the first time one realized the vitality of life, and could contrast it (with a sort of self-reproach) with one's previous career on a lower grade of being. Unfortunately, the logical deduction from that experience is the somewhat impracticable one that life should be spent either on the heights of the Sierra Madre or nowhere.

At an altitude of about 4000 to 5000 feet commences the zone usually spoken of as "timber-line"; that is, the level at which the growth of mountain oak and certain trees of the tropical habit give place to forests of pine and cypress. In the middle latitudes of the range, and at its greatest width, these are of vast extent, and in the more sheltered portions very heavy timber is developed. Though not equalling the giant productions of the north, trees of 100 to 150 feet in height, and 10 to 15 feet in girth, are frequently met with. The contrast above this line, in the matter of animal life, is striking. While the barrancas and mountain slopes up to 2000 feet are swarming with birds and insects, and ringing day and night with the chatter of cicadæ and tree-toads, the silence of the pine forest is unbroken at all seasons, except by the occasional note of the few birds which find food and a home there. Deer are tolerably abundant, and the brown bear inhabits the cañons, though by no means easily hunted out of his favourite resorts. Yet the tropical character of the fauna and flora up to the very edge of the timber-line is distinctly marked. Large flocks of parrots of several varieties are daily visitors at this altitude, coming up in the early morning from the hot lands of the coast in search of some favourite fruit or seed, and returning at sundown over distances which must involve a daily flight of at least 100 miles. The pine forests are generally devoid of undergrowth, except in the deep cañons, and are frequently carpeted with a fine lawn-like grass. I have noticed a few varieties of cactus—especially the Mammillaria—as high as 2500 feet, and, according to local circumstances, they may probably be found at greater elevations.

For reasons which are easily appreciated, the population of these mountain districts has always been scattered, and more or less migratory. Next to the variety and uncertainty of the sources from which they have been derived, the chief cause, perhaps, is that, being recruited mainly from amongst a people of tropical temperament and habits, the winter climate of the higher altitudes has always been an obstacle to their permanent residence.

Even now, had it not been for the inducements of agriculture in the fertile upland valleys, and the still stronger allurement of their vast wealth in silver ores, it is likely that the Sierra Madre would still be the undisturbed retreat of the bear, the jaguar, and the antelope. But unquestionably the most interesting ethnographic feature of the present period is the continued isolation of a few distinct races which have been planted there from original sources, and whose fusion with the Mexican nation of to-day has been retarded by the circumstances of their life. These sources are still distinguishable, more or less, as North American, South American, and probably Asiatic, with, of course, a contingent of European since the Spanish invasion. The chances which have scattered these various families so unaccountably are the resultant of too many fortuitous occurrences in past times to leave much hope of tracing them now. Yet the visitor who passes amongst them cannot but speculate with the deepest interest on their origin. Why, for instance, do we find in the deep and remote cañons of Sonora those few remnants of incorrigibly hostile Apaches whose hand is against every man's, and only a little further south, on the heights of Chihuahua, the timid yet athletic race of cave-dwellers, whose only anxiety is to hide from even the friendly stranger? Here we have a fighting race whose predatory instincts will never be subdued until their final absorption into the Mexican nationality, and, as it were next door to them, a race whose disposition has for ages been eminently peaceable. While the only instinct of the Apache is to shoot down the stranger and commit raids upon his property, the life of the cave-dweller is simple and hardy, and his cultivation of physical health a religion. Their young men scour the plains like an antelope, and hunt down the deer on foot till it drops exhausted. They are even systematically trained to this tremendous exertion by a game somewhat allied to our golf, in which they are required, before qualifying for the deer-hunt, to drive a wooden ball over the level plains for 100 miles without a halt. I am able to quote an instance in which a youth of twenty years pursued a deer on foot for a distance of 135 miles before he exhausted and killed it, and within two days carried it back to the point of starting.

Why, again, do we encounter, not much further south, the quiet, sympathetic, and somewhat artistic tribe of the Cota Indians of Durango, and in the same State, as well as further east in Queretaro and Hidalgo, the abjectly miserable nomadic families, wholly distinct in colour and physique, and more resembling the distant Shoshones of the Yuma Desert? The former are distinguished by their cordiality to the stranger, and their dexterity in manufacturing those trinkets and implements which he delights to collect, while the latter seem incapable of any purpose in life but to exist on the barest possible necessaries.

Still more curious is it, on proceeding yet further south, to find on the western mountains of the Tehuantepec isthmus the stalwart and finely developed Zapotec Indian, whose splendid physique and superior intelligence exemplify the real or supposed "noble savage" of the American continent. The women of his race are also remarkably handsome—a characteristic which, so far as I am aware, can scarcely be claimed by any other Indian family in Mexico.

That the origin of these local tribes is attributable to different and far-distant sources is further evidenced by the diversities of their language. Instances are encountered at all points of the range where Indians are found, from New Mexico to Guatemala, where two settlements possessing a common or nearly common dialect are separated by another with a language entirely foreign to them. Of this I met with an instance in the autumn of 1893, on the east bank of the Rio Grande, at the foot of the Ute mountains in New Mexico, where the speech of the original Pueblo Indians of Taos is known to the Utes of another Pueblo in the second valley northward; while that of a tribe inhabiting a cañon between the two is wholly strange to both. Amongst the various tribes of so-called Snake Indians, of whom the

Shoshones are a branch, there are said to be no less than seven distinct languages, which have preserved their individuality notwithstanding the wanderings and subdivisions and occasional annihilations of these tribes from distant periods. At this moment there still exists a code of signs used by the Apaches of Sonora, unknown, it is believed, to intermediate tribes, but recognized by the Flathead Indians of Wyoming, more than 2000 miles to the north. It would be venturing beyond the scope of a geographical account to inquire more closely into the distinctive histories of these mountain peoples. But it may be observed that they confirm strongly the view which I have long entertained as to the existence of a large though scattered contingent of Asiatics amongst the early races of Central America.

In modern times the mountain ranches and mining camps have, of course, introduced a new contingent of population from other sources. Amongst that section which may strictly be described as Mexican there remain many evidences of contact with the conquered races of the Montezuma period. Customs and industries still prevail which must be identified with those times, though no amount of inquiry will avail, in many cases, to fix their precise origin.

Not the least remarkable characteristic of this mountain population of Mexicans is the prevailing condition of abject poverty in which they apparently prefer to live. There seems to be in this an actual heredity, apart from other and proximate causes, such as occasional barrenness of soil, severity of climate, or native indolence. The latter is, of course, a chronic condition amongst them; but even in individual cases where it is less strongly marked, there seems to be an actual preference for the extremes of exiguity, simply because the same habit of needless and inexplicable misery has descended from father to son. It is no uncommon experience to see an almost incredible degree of actual physical suffering persistently endured under circumstances where the commonest comforts might be obtained almost without an effort, and this amongst a comparatively intelligent class in which the profound ignorance of most of the Indian tribes cannot be assigned as a reason. Many a time it has chanced to me to pass the night on the floor of some wretched "jacal," or shanty of interlaced saplings, where, at an elevation of 6000 or 7000 feet, the March winds rushed through almost unhindered. Here I have seen the Mexican family and its guests stretch themselves around me, half wrapped in their scanty serapes, some prostrate with influenza, some with chronic bronchitis, and all bemoaning themselves audibly in the misery of cold, while for miles around the doors lay countless thousands of huge pine-logs and fallen branches, rotting on the ground, and five minutes' work by one of the children might have brought warmth and comfort to the whole community. But the scrap of fire used for toasting the tortilla has been allowed to die out. It has never been the custom to use heat for any purpose but cookery; and the log-fire indulged in by the chance traveller for his own convenience is regarded as a strange extravagance, consistent only with those general conditions of exotic wealth which he is invariably supposed to represent. The accompaniments of a pack-mule carrying a blanket, an overcoat, and a box of tinned provisions, are sufficient to mark the foreign traveller of wealth and luxury, and draw upon him the wondering attention of the populace. At the same altitudes ranches are met with where, in the summer season at least, every means exists for rendering the condition of life easy and even luxurious, and a bountiful supply of such common necessaries as eggs, milk, fowls, fruits, and vegetables could be maintained without cost and almost without labour. Yet the very free gifts of Nature are ignored because it has been the custom to live upon horse-beans and tortillas, and there is no precedent for attempting anything more.

The remains or traces of ancient habitations throughout the western range of Mexico are so numerous and varied in structure as to form a study in themselves, upon which volumes might be written. To describe and compare even those few which have come within my own observation would be a far greater task than time and space will allow. I may select, however, one of a typical class which was visited in the spring of 1893 during a journey into the Sierra Madre in Sonora, and which has not, I believe, been examined by any other European. The situation, in the absence of any local nomenclature, is not easily described; but the site is an offshoot of a valley in the heart of the wildest mountain region about 300 miles south-west of the American town of Deming, on the Mexican frontier, and separated by two high ranges from the valley of the Bavispe. A small tribe of Apaches are said to be located somewhere in the vicinity, although I could obtain no definite information as to their whereabouts. The valleys are deep and narrow, abundantly clothed with vegetation, the altitude being under 3000 feet, and tenanted by deer, antelopes, and wild turkey in large numbers. This offshoot is a short jungle-grown cañon amongst the intricacies of the mountains, approached by a riding-trail leading towards Bacerac. It is closed at the upper end by a vast vertical cliff of horizontally stratified breccia some 200 feet thick, dotted with embedded boulders, and having a foot-slope of broken rock. At the base of this cliff is a hollow formed partly by the washing down of loose materials, extending for nearly its whole length. At the back of the hollow it is prolonged by several long caverns on an ascending grade, penetrating to further depths within the mountain, and half filled with rubbish heaps containing many curious relics of early habitation. The entire front face of this singular natural fastness had been fortified with concrete walls, behind which chamber after chamber had been constructed in and beneath the loose material, ranging inwards on a level beneath the natural caves. These inner chambers were absolutely without light, and on entering them with a candle I found access from one to another by means of small square openings in each back wall, about a couple of feet above the floor. These were only of sufficient size to permit a man to creep through, and were evidently intended to be easily blocked. The chambers were entirely empty and clean, the floors being of dry earth, and all the walls, both inner and outer, whitewashed. In this dry atmosphere, the concrete walls, and the roofing of carefully sized round pine logs and canes, had remained in as perfect preservation as the day they were built, and were of far superior workmanship to the ordinary adobe houses constructed by the Mexicans or Indians of to-day. In the outer line of wall, splayed loopholes of peculiar form were provided for the discharge of arrows, and other special openings for the entry of the occupants. While the natural caves were used as storehouses and depositories for clean rubbish, the subterranean chambers were evidently devised for the security of women and children, and probably as sleeping-places. A Mexican who accompanied me was greatly struck with the identity of this system of successive chambers with that used by the Chinese at the present day. His independent conclusion that the constructors of these buildings must have been of Asiatic origin appeared to me well worthy of note. With the steep slopes of broken and jagged rock below, covered with tangled undergrowth, a more perfectly impregnable site for such a dwelling could hardly have been devised.

The period of this remarkable fortress it is impossible to assign; it may, however, have been occupied by the ancestors of the present rapidly vanishing Apaches at a time anterior to the Spanish conquest—probably much earlier. The neighbourhood of the terraced gardens, fixed receptacles for water, and numerous irregularly placed burial-sites indicate the permanent habitation of a people who, while industrious, and perhaps even luxurious in some degree, were accustomed at any moment to attack and defence, and to the protection of their community. It is noticeable that all the cave dwellings, fortifications, and burial-places of this region are now described by the general name of "Montezumas"—meaning, presumably, works of the Montezuma Indians; though this, of course, indicates nothing more than the races found in occupation at the period of the conquest.

Amongst various objects in the rubbish-heaps (which, unfortunately, time did not allow me to examine carefully), I found the dried rind of a small melon, and numerous cobs of a very small species of maize, neither of which, so far as I am aware, is to be found in Northern Mexico at the present time. Broken pottery was abundant, but any articles of utility are likely, if not buried, to have been removed by subsequent wanderers. Not far from the same spot has been found a huge "olla," or water-tank, formed by lining a globular excavation in the rock with clay and (probably) burning its interior *in situ*. A flight of steps cut in the rock lead up to a position above the cavity from which the state of its contents could be examined and supplies drawn, though an enemy might never have discovered it.

The remains of the terraced gardens in the beds of the steep gullies of these Sonora mountains were for some time a puzzle to me, their low stone breast-walls leading me to suppose that they represented silted-up dams, intended to have caught the descending waters. But the explanation given by some local miners, that they were in fact soil-dams, into which the torrents had washed the best alluvial matter from the surface, seemed to be confirmed by every appearance of these curious works. A succession of level plots of the highest fertility was thus secured by utilizing the operations of nature, saving the labour of levelling and ploughing unbroken ground on steep and inconvenient declivities. They are simply an outcome of peculiar surrounding conditions. Further south, amongst the abandoned mountain villages of Sinaloa, Jalisco, and Michoacan, where the mountain structure is less crowded together and the valley bottoms more open, I know (at present) of no similar examples. These latter, moreover, were the domiciles of a wholly distinct race, who left their record in the innumerable rock inscriptions, which will furnish one of the most interesting studies of the future in the western Sierra Madre. Rarer and less artistic these records become as one traces them northward in the range; more abundant, varied, and complex as one follows them to the south, until amidst the mountains of Chiapas the story culminates in those marvellous palatial ruins whose origin is one of the unsolved problems of human history.

I will conclude by describing briefly a few of the industrial and other mechanical appliances met with in the course of several journeys into and across the Sierra Madre ranges, and I select those which specially seem to be links with the intelligence of a people whose habits and traditions have now so nearly disappeared. The comparatively warm and equable climate of the Sierra Madre has always invited the application of those means of cultivation and trade which had already been learned elsewhere by the settlers, of whatever period or country, who have made it their adopted home.

In a mountain region the means of transit and of communication between settlements are also of primary importance, and, rude as the devices for effecting these objects usually are, they illustrate the necessities arising from particular natural conditions. As already observed, it is characteristic of the Sierra Madre range that widely different physical features are encountered within comparatively short distances. It is also characteristic of all isolated communities of people that traditional ways and means of accomplishing any particular purpose are accepted for all time as the best. Nor can it be denied that in many cases they actually are so; and the civilized observer, to whose mind innumerable improvements promptly occur while he smiles at the crudeness of the methods employed, is sometimes surprised at being driven, later on, to the conclusion that the uncivilized appliance is, under the circumstances, the right one after all.

An instance of this occurred to me on having to cross the river Moctezuma, one of the few considerable streams of Mexico. Being on foot, I was conducted to a point where the river (then at high flood) traversed a steep gully some 300 feet deep, and was introduced to a method of transit known as the "trapezio." On each side of the stream, at the foot of the high cliff, was a level bank some 30 or 40 feet above water-level, to which a descent was made by a zigzag trail down the face of the rocks. On each bank was erected a species of upright windlass or capstan, constructed of rude but substantial logs, with a central pivot operated by four arms, after the manner of a turnstile-gate. Connection was made across the river—a span of some 200 yards—by a pair of stout cables attached to each capstan. A collar or runner, consisting of a section of a solid log drilled with two holes, was arranged to slide on the cables, and drawn by a separate rope from each end, wound upon the two capstans. From this sliding block were suspended ropes, by which all freight—human and otherwise—could be slung up in a bunch. On the signal being given by a whistle that the load was ready, four men entered the capstan on the opposite bank, and proceeded to wind the burden across the river. I thus saw a load of half a dozen sacks of maize, several faggots of wood, and five or six Indian women and children, safely packed and landed at one operation. Being a stranger, I was permitted, when my turn came, to occupy the slings with only the company of my servant and a few meal-bags. When packing passengers for the crossing, a cord is passed under the arms, and another under the knees, and tied to the main sling, and thus secured one is launched out over the boiling rapids, with one's life hanging upon a couple of moderate-sized cords. The passage, however, was accomplished in safety, and by these primitive means a very considerable traffic is conducted. The whole mechanism is of timber and rope, of the roughest possible construction, yet solid and effectual. A suspension bridge at the same point would cost, say, £500. The trapezio is probably constructed for less than £20.

Another singular example of mechanical handiwork was an antique sugar-mill, observed while crossing the Sierra Madre from Culiacan, in Sinaloa, to the interior. Its situation was in a deep cañon on the upper course of the Culiacan river, where neither the production of the sugar-cane nor the existence of such an industry would have been suspected. As it was, however, every available patch in the neighbourhood showed a luxuriant crop of cane, and the sound of the crushing-mill proclaimed its existence for at least a couple of miles up and down the gorge. The apparatus consisted of two round logs pivoted in a shallow pit, and powerfully compressed by straps of some fibrous leaf or stalk. These were caused to revolve by means of a lever to which a mule or an ox or both together were hitched, and the canes passed between the logs by the hands of a man standing in the pit. The juice flowed into a stone channel below, and was conducted into the boiling-vats. These were under a rough shed on the edge of a bank, in which the furnaces of stone were constructed underneath. The concentrated syrup was ladled out and poured into small loaf-moulds cut in a wooden slab. Rough in the extreme as the whole operation was, the produce was undeniably a very respectable unrefined sugar.

Time forbids me to multiply instances like these of what may be termed creative ingenuity, by which industrial appliances are evolved *de novo* by the needs which natural surroundings create or suggest. The geographical and climatic range of the Sierra Madre, varying from a region where pine lumber is felled in the snow to one where ebony and mahogany are used as fuel for baking cakes, contains probably a realm of research, as varied, within a comparatively limited area, as any on the globe. I have endeavoured merely to sketch the points of interest noted during many casual journeys through and about the range, but it is in the hope that, by others to whom the opportunity occurs, a real study may be attempted of some of those of most prominent value. Foremost amongst them I must place the study of the existing populations, because the time is shortening within which their history can be even partially unravelled. The growth of a new homogeneous nation, where the process of fusion is once established, proceeds with strides; and while one wanders amongst those wild crags and recesses, which we hope may never again echo to terrible Apache war-cry, one cannot but regret that the last remnants of the people who might throw a ray of light on the story of their past will so soon have vanished beyond recall.

Before the reading of the paper, the CHAIRMAN (Mr. W. T. Blanford, Vice-President) said: The paper to be read this evening by Mr. Howarth is on the Sierra Madre, in Mexico. As it has unfortunately, owing to the absence of the President, fallen to my lot to take the chair, and as I am entirely unacquainted with Mexico, all I can do is to introduce our lecturer.

After the reading of the paper, the following discussion took place:—

Signor ROMERO: I was kindly invited to attend this evening this interesting lecture, and have enjoyed it very much. I have travelled through the same parts, and the description of them is entirely true.

Admiral Sir ERASMUS OMMANNEY: I think the lecturer traced that
aborigines had some idea they descended from North America. I shou
ask him whether he has any conception whether the Eskimo languag
connection with the ancient Mexican languages.

Mr. HOWARTH: I am afraid very little can be said in reply to that
for a reason which I think, to a certain extent, I pointed out. The M
is such an extremely complex one that its languages are conse

official language now is Spanish, but it is for that very reason I think the history so extremely interesting. I have been endeavouring to draw attention to the necessity of its study, as soon we shall be losing all those threads which will enable us to make the study of the Mexican past effectual. I am sure the study of the languages would do a great deal to elucidate the very question just asked. If the existing independent tribes in Mexico could be studied separately, and something ascertained about their separate languages, their separate customs, and identification established between them and those to the north or the south, I think there is a great field for inquiry which would have extremely remarkable results. I am afraid it is impossible to say anything worth saying in reference to the identification of languages and habits and customs without a considerable further degree of study, but the point I have been insisting upon is, that if any inquiry is to take place into Mexican history it must take place in the next few years, or all the threads to the past will be lost.

Mr. Blanford: I think I need scarcely ask you to give your thanks to Mr. Howarth for an extremely interesting lecture. The question he has raised about the origin of the peculiar tribes found scattered in the mountain ranges is very interesting. It will be well within the memory of many here that a similar question has arisen in the Himalayas, with reference to tribes that are rapidly dying out and are difficult to trace; and it is well known that an interesting tribe living in the Neilgherries have no connection with any other people in India. Similar cases seem to be found in many tribes entirely isolated who exist in portions of the mountain ranges.

A SECOND EXPEDITION THROUGH THE BARREN LANDS OF NORTHERN CANADA.*

By J. BURR TYRRELL, M.A., B.Sc., F.R.S.

Towards the end of May, 1894, the writer was instructed by the Director of the Geological Survey of Canada to continue the exploration of the country north-west of Hudson Bay, beginning at Reindeer lake, and coming out at some point on the coast of the bay. In previous years it had been learned that the Chippewyan Indians regularly used a canoe route from Reindeer lake northward up Ice river, and across many lakes and portages, to the head of Kazan river, which flowed northward or eastward. The Telzoa river, lying further west, had been found in 1893 to flow into the head of Chesterfield inlet, and therefore the mouth of the Kazan river could not be further north than Chesterfield inlet. Several Indians had assured the writer that, although they had never descended the river, they knew from report that it flowed into Hudson Bay a long way south of the mouth of the Telzoa river, and that it was a fine large stream without heavy falls or rapids, and that it would not take more than six days to descend it from the source to the sea. These statements, taken together with the map made by Samuel Hearne in 1772, seemed to favour the belief that

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Kazan river flowed into the west coast of Hudson Bay somewhere north of Cape Eskimo, and was not improbably the river flowing into the bottom of Neville's Bay, which was seen in the fall of 1893. Although the season was rather too far advanced, it was therefore decided to try the descent of the Kazan river. All the statements made by the Indians from report were found to be incorrect and misleading, for the river is now known to be obstructed by one or two falls and many swift and dangerous rapids, and to flow into the south side of Baker lake in Chesterfield inlet, not far from the mouth of the Telzoa river.

Early in June Mr. Munro-Ferguson and the writer proceeded by rail to Winnipeg, and thence to Selkirk, the port near the south end of Lake Winnipeg, where three native canoe-men were hired and the bulk of the supplies were obtained for the season. A supply of provisions had also previously been purchased and sent up to Fort Churchill, on Hudson Bay, by the Hudson's Bay Company's annual steamer *Eric*, to serve on the return trip, or in the event of our being delayed at Churchill.

On June 16 the party embarked in a steamer at Selkirk, but it was the 22nd before it reached Grand rapids, at the mouth of the Saskatchewan river. Here the canoes were put in the water for the first time, and two additional men were employed to accompany us in a birch-bark canoe, loaded with supplies, up the Saskachewan river for 200 miles, as far as Cumberland house, which was reached on July 2. On the way we were delayed for two days by a heavy storm, and our progress was greatly retarded by the rapid current of the river, which at that season of the year was at extreme high water. Very little could be seen while ascending this river but the wide marsh extending out on both sides, except at "The Pas," where the trading-store and mission were found to be built on a diffuse morainic ridge, probably a northwestward continuation of the moraine north of Lake Winnipegosis, which, towards the end of the glacial period, represented the front of the great Keewatin glacier that travelled southward from a centre of dispersion in the country towards which we were journeying.

Unfortunately, some of our provisions had been lost by the upsetting of one of our canoes in Calico rapid, below Cedar lake, but we were able to replace most of them here. An additional Indian was engaged as steersman for one of the canoes, and two others were employed to accompany us in the birch-bark canoe as far as Du Brochet trading store, at the north end of Reindeer lake, from which place they were to return. The two men employed at Grand rapids returned from here.

On July 4, the party, still in one birch-bark and two cedar canoes, left the Saskachewan river at Cumberland, and turned northward up Sturgeon-weir river, continuing to travel through a low, flat country thickly wooded with spruce and poplar, and underlaid by horizontal white limestone, generally rather poor in fossil remains; but enough were found to show that the rocks are of Cambro-Silurian (Trenton) age, similar to those near the mouth of Red river. On the north side of Beaver lake, the horizontal Pálæozoic limestone was left behind, and a country was entered which consisted of rocky hills of Laurentian granite and gneiss. We continued the ascent of Sturgeon-weir river, through several lakes, connected by stiff rapids, past which the goods were carried over the rocks. At one of these rapids is a beautiful series of pre- (or inter-) glacial pot-holes, worn out of the solid granite, where there appears to have been a heavy rapid on a large stream flowing southward. It would seem probable that Deer river continued to flow southward at that time, and the outlet towards the east, of both it and Churchill river, is of more modern date.

From the head of the Sturgeon-weir river the goods and canoes were carried for 330 yards across Frog portage to Churchill river, whose waters flow along the north side of a narrow ledge of rock 10 or 12 feet higher than the source of Sturgeon-weir river. In times of flood the water from the former stream pours over the rocky ridge into the latter.

Below Frog portage Churchill river is descended for a few miles, passing some conspicuous sandy eskers on the north bank, and then, without leaving the same great valley, the ascent of Reindeer river is begun. The river is deep and wide, often without much current, like a long narrow lake, with but five rapids in its whole course, past four of which the canoes are carried for short distances.

Reindeer river flows southward from the south end of Reindeer lake. For five days we skirted the eastern shore of this beautifully clear lake, winding among its almost innumerable rocky islands, until, on July 18, we reached its northern end, where the Hudson's Bay Company have their most northerly trading post in this district, and the Roman Catholic Church has a well-appointed mission. Here the Chippewyan Indians visit from the surrounding country two or three times a year to barter their furs and deer-meat for ammunition and clothing, and to perform their devotional exercises. About Christmas-time a few Eskimo come in from the far north, bringing robes and furs to trade for ammunition and tobacco, but throughout the remainder of the year the trader and the missionary are almost alone.

At this place, which is usually called "Du Brochet Post," the two Indians whom we had engaged at Cumberland were sent back in the birch-bark canoe, and two Chippewyan Indians were persuaded to promise to accompany us northward in their own canoe, as far as Ennadai lake, on the Kazan river, with the double object of acting as guides and helping us to carry our provisions.

Up to the time of our arrival at this place we had travelled in canoes for 650 miles, through country which was already to some extent known, at least geographically, and we had, therefore, hurried forward towards the unknown country ahead of us, devoting all the time caused by necessary delays to the study of the adjoining rocks, and not to the making of any regular survey.

At Du Brochet post observations were taken for latitude and the variation of the compass, and on the afternoon of July 20 we left this last remote abode of civilized man, and began the ascent of Ice river, measuring the quiet stretches with a Massey's floating boat-log, estimating the stretches of running water, taking the bearings with a prismatic compass, using a solar compass occasionally to correct the variation, and taking the latitude daily, if possible, with a Hadley's sextant of seven-inch radius, and a mercurial artificial horizon. The river was ascended in a general northerly direction for 121 miles, to a point on its east bank, where the Indians usually leave it and carry their canoes over a steep-sided sandy ridge for a third of a mile to a small lake. On the afternoon of July 27 we left Ice river, and carried our canoes, provisions, and supplies across this portage, which proved to be the first of a long chain, forty-four in number, with an average length of 544 paces, or a total length of about 13 miles. The paths were usually over rough, irregular masses of broken rock, and as a rule it was necessary to make four trips over each portage to carry the canoes and their loads. Since leaving Reindeer lake the country had been an irregularly undulating till-covered plain, wooded with small black spruce and larch; but the first portage from Ice river was over a long sandy esker, whose slopes were wooded with tall white spruce and canoe birch. The canoe route passes through several small lakes lying to the east of this esker, and then crosses a very stony moraine that has turned the Ice river abruptly southward, after it has flowed north-eastward from Wollaston lake, and separates its waters from those flowing northward into Thlewiaza river. Blue lake, just north of the moraine, and at the head of the latter stream, is about 50 feet lower than the water at the bend of Ice river, 2 miles to the south.

An esker continues northward along the west side of Blue lake. It is wooded with tall white spruce, and on its warm south-eastern slope is a grove of small poplars (*P. tremuloides*), an apparently isolated occurrence of this tree in the midst of the surrounding coniferous forest. The route descends the stream through Thanout and Theitaga lakes, by the former of which an Indian chief named Red Head has a small but substantial log house in which he spends the winter. From Theitaga lake the Thlewiaza (or Little Fish) river was said to flow north-eastward to *Nov-el-tin*, or *Island-lying* lake, beyond which it flows, at first down a series of heavy rapids, and then with quieter water, until it empties into the west coast of Hudson Bay between Egg Island and Cape Eskimo.

The route to Kasba lake leaves Theitaga lake, and ascends a small tributary coming from the north-west. Here, about the end of July, in a grove of low birches, we saw a flock of the beautiful Bohemian wax-wings (*Ampelis garrulus*) fluttering about among the leafy branches in the long cool evening. They were clearly on their breeding-ground, but the need of pushing on with all possible haste prevented us from searching for their nests. We ascended this brook for several days, hauling or carrying the canoes; then we crossed a low divide between small lakes, and on the evening of August 5 pitched our camp on the sandy shore of Kasba lake. Behind us granite hills rose to heights of more than 400 feet, while long lanes of water stretched north and south between the rocky stony ridges, with belts of dark green forest skirting the bases of the adjoining hills, or covering the lowlands.

After suffering a delay of a day and a half by a storm, we were able to launch our canoes on Kasba lake, and start northward over its clear blue water. A survey was made of its eastern shore, which consisted of sand or boulders, while the hills behind rose in long rich grassy slopes. Kazan river flows from the east side of Kasba lake, and rushes for 30 miles in a shallow channel down a long regular till-covered slope to the south end of Ennaida lake, where, in a grove of tall white spruce, the Indians regularly pitch their camp in autumn to await the reindeer as they cross the water in their migration southward. This was the most northerly grove of white spruce noticed on Kazan river. Our Chippewyan guides had now done all that they had originally agreed to do, by taking us down the Kazan river as far as they had any knowledge of the country. We had reached the northern confines of their hunting-grounds, and the great treeless wastes to the north were supposed to be thickly peopled with unfriendly Eskimos, who would almost certainly destroy them.

Near this white spruce grove, therefore, we paid these kindly Indians for their services, and paddled northward over the cool surface of Ennaida lake without native guidance of any kind. Our party now consisted of Mr. R. Munro-Ferguson and the writer, with four canoe-men, in two cedar canoes. An unknown river, with many broad lakes, lay between us and some point on the west coast of Hudson Bay; beyond which was the inhospitable treeless shore of the bay itself.

During the day the wooded country was left behind, and at night camp was pitched on the Barren Lands, where a wet boggy flat extended back from the shore of the lake. The next day one of the storms that almost unceasingly sweep across these open wet plains of the Barren Lands broke over us, and drove us into camp under a high hill of gneiss on the east side of the lake, where a little rill, trickling down among the stones, supported a few low dwarf spruce and larches.

The storm continued to rage for three days, with showers of snow and rain, and prevented us from putting our canoes in the water.

Up to this time we had not seen any deer, and had not been able to shoot anything for our support; but on August 14, after the storm was over, we crossed to the west side of Ennaida lake, and there, for the first time during the season, we fell in with Barren Ground caribou travelling southward in large numbers. The deer were rather difficult to approach in the open treeless country, but several were soon shot, and their meat spread out to dry in the sun and wind, so that we might have a supply of dried meat to carry with us.

Kazan river flows from the extreme north end of Ennadai lake, and, resuming its rapid current, it rushes in a shallow channel amid stony morainic hills, past the last considerable grove of small timber, and just below some sandy kame-like ridges opens into a small lake, on whose eastern bank Kopannak and several other Eskimo, with their families, were living in two large deerskin tents. On our approach, the inhabitants left their work of skinning and dressing deer, and fled away to the top of the stony hill to the west. After a while they became convinced of our friendly intentions, and slowly returned.

We now felt very keenly the need of an Eskimo interpreter, for they could not understand our languages, and none of us could speak a word of theirs. However, after considerable difficulty, one of the Eskimos was induced to draw a rough map of the remainder of the river, which appeared to show that it flowed through several large lakes, and then emptied into the west side of Hudson Bay south of Marble island. Delighted with this information, and accompanied by three Eskimos in their deerskin kyacks, we continued down the river, through the cold pelting rain, to the tent of a bald old man named Hai-kuakuak, where we camped for the night.

On the following day the same Eskimo accompanied us, attracted by the small presents of needles, tobacco, etc., that we were able to make to them, and by the novel sight of white men journeying through their country, which spreads out on both sides as wide, undulating, grass-covered plains. Two Eskimo villages were passed, and towards evening we reached a third, consisting of two tents inhabited by Hallo, Ahyout, Kakkuk, and another, with their families, or about sixteen persons in all. We were now at an elevation of about 1000 feet above sea-level, and we knew that we had to descend that distance before reaching Hudson Bay, so that it was probable that many rapids and falls were still ahead of us, while much time might be lost in searching our way through the irregular lakes. It was therefore necessary, if the journey was to be continued at this late season of the year, that a guide should be secured. At length, after a long parley, with a promise of a gun for himself, and tobacco, beads, and knives for many of his relations, we induced Kakkuk to accompany us. His father, Ahyout, at once volunteered to go a short distance with his son. The next day, when the women were left well behind, Ahyout informed us that he would accompany us to the sea, at the same time making the very modest request that we would keep him supplied with sufficient tobacco to smoke on the journey.

With our two Eskimo guides, we continued across small lakes and down steep rapids, the sides of which were of rounded boulders packed into a solid wall of dry masonry by the shoving of the heavy ice in spring. Almost every day we passed two or three Eskimo villages, where we were welcomed kindly, and where our presents of tobacco were received with shouts of joy. With needles, thimbles, beads, etc., we purchased deerskin clothing to protect us against the severity of the rapidly approaching winter.

On a large lake, called by the Eskimo Angikuni (or Big) lake, we were again delayed for three days on an island by a heavy storm. A day or two afterwards we reached Pasamut's village, at the foot of a series of heavy rapids and falls, where about sixty-five Eskimo were living in seven tents. Here we learned for the first time that the Kazan river, which we were descending, empties into Baker lake or Chesterfield inlet, and not into Hudson Bay direct, as we had previously been led to suppose. To follow it to its mouth, and then to coast down the shore of Hudson Bay, would be quite impossible at this late season of the year. After making diligent inquiries, however, we learned that it would be possible to leave this river below, and, by a chain of long portages, reach the head of another river that flowed into Hudson Bay opposite Walrus or Seahorse islands. In spite of the protestations of our Eskimo guides, who wished to reach salt water by the shortest way, we at once determined on trying this route.

On August 30 and 31 we crossed Haicoligua or Tath-kyed lake, just above which, on a sandy flat on the west bank of the river, is a small isolated grove of larch trees. During the previous week no wood had been seen except a few willows and low dwarf birches (*Betula nana*), and a very few black spruces, here reduced to a foot or two in height. Tath-kyed lake is generally surrounded by a wall of boulders, behind which rise rather high grassy hills, probably underlain by Laurentian gneiss, covered with a thin coating of till. Many of the boulders are derived from the red Keewenawan sandstones and quartz porphyries to the north and north-west.

A short distance down the rapid river below Tath-kyed lake we came to an Eskimo village, where six additional men were hired to help us across the portages, one of them agreeing to accompany us to the sea, as our guides did not know the way any farther.

On September 1 we left the Kazan river, and started to carry our canoes and stuff eastward over a chain of twelve long meadow portages. The day was beautifully fine, and gave us an excellent opportunity of taking observations for latitude and variation of the compass. The point where we left Kazan river was found to be in north latitude 63° 7′, with a variation of the compass of 20° 45′ east. These observations were particularly fortunate, as for the next twenty-three days the weather was constantly stormy or overcast, giving us no opportunities of correcting our positions by astronomical observations.

For five days the men toiled over the level wet grassy portages, until at length we reached the shore of a lake, which, with the river flowing from it into Hudson Bay, I have named Ferguson lake and river, after my friend Mr. R. Munro-Ferguson, who was my constant companion during the expedition. He was the first white man who, in an unofficial capacity, inspired by the true spirit of adventure, descended this remote northern river.

The shores of Ferguson lake are rocky, composed of bare hills of trap, or dark green Huronian (?) schist. Grassy terraces of sand and gravel rise up the sides of the hills, indicating old marine shore-lines, when, at the close of the Glacial epoch, the land was depressed between 400 and 500 feet below its present level. The rocky country continued down the river to Kaminnriak lake, a large body of clear water extending an unknown distance north of our line of route. The rock now disappears for a time, and the shores of this lake spread out into wide, undulating, grassy, till-covered plains. Two more small lakes lay in the course of the stream on this till-covered plain, and then Ferguson river again entered a country of bare, rounded, dark green massive or schistose rocks that extended from this point eastward to the shore of Hudson Bay.

Up to this time there had been very little difficulty in keeping the party supplied with fresh deer-meat, but in the rocky country no deer were to be seen, and from this time forward we were obliged to live on dried deer-meat and the residue of imported provisions that we were carrying with us. The constant storms now began to increase in violence, with heavy falls of snow, which covered the whole country in its white winter mantle, and caused us long continued delays, so that we were unable to reach the mouth of Ferguson river before September 18, only three days earlier than we had been beset by storms on an adjoining cape in 1893, at which time winter had permanently set in. Our Eskimo guides were now paid off, and we parted with them with much regret, for during the month that they had been with us we had become excellent friends.

In 1893, from the time of our arrival here, it had taken us twenty-eight days to reach Fort Churchill, and should we this year experience similar weather, a very unpleasant part of our journey was evidently still in store for us. But the day was calm, and while our three Eskimo friends turned back up the river, we paddled out with the tide over the salt water of Hudson Bay, camping for the night on a bold rocky point a few miles south of Sir Bibby island. For the next two days a st
south wind, with heavy flurries of snow, greatly retarded our
but after dark on the second evening, when the tide was up
on the low flat shore a few miles north of our cache of last
next morning was cold and cloudy, with a south-east wh
the tide rose, the writer walked southward along the sh
Munro-Ferguson brought on the canoes as so

launched. It was impossible to reach the cache before the tide ebbed, and it was therefore necessary to land and remain one or perhaps several days, or to get into the canoes and travel on, going out with the tide. As our canoes were now loaded with all they could carry on the open sea, it was deemed highly inadvisable to risk the loss of even a day at this late season of the year, 300 miles from Churchill, with the rigours of a subarctic winter closing around us, on an uninhabited barren coast, with no fuel but three pints of alcohol.

For the next few days the weather continued passable; but the tide, which here runs about 15 feet, and retreats at ebb for several miles, was at its height near midday and midnight, and we were unable to travel for more than two or three hours near the high day tide, for the many boulders scattered over the shore made travel at night dangerous or impossible.

The hills on the shore north of Cape Eskimo are rough, stony, morainic ridges, while Cape Eskimo itself is a long, narrow, sandy esker extending eastward towards the bay. South of Cape Eskimo is another similar esker point, behind which are some rough hills, probably morainic in character. The day after we passed Cape Eskimo we were travelling along a low flat shore. The tide was at its height shortly before noon; but we continued on our course until after two o'clock, when, finding that the tide was ebbing very fast, we turned towards shore, but were unable to get within 1½ mile of land, when we went aground on the sand and boulders. The canoes were then carried for more than a mile to a small island below spring-tide level, where camp was pitched, trusting that an east wind would start up in the night and drive the rising tide over. The water around us was found to be fresh, and we soon saw that we were camped in one of the mouths of a river, probably of considerable size. The night was starry and cold, and an observation showed that we were in north latitude 60° 49′ 45″. Before dark the tide had receded so far that the sea could not be seen from our camp. The next morning the water was frozen around the tents. We carried the canoes out a third of a mile to meet the incoming tide, and were afloat an hour and a half before the tide was at its height. For the next two days we travelled in a similar manner, carrying our canoes and stuff to and from the shore. On the third day, September 26, we caught the high tide in the early morning, and went out with it. Just as the day broke a heavy fog set in, and hung over us all morning, covering the canoes and everything in them thickly with frost crystals. Many times the canoes were in danger of destruction from cakes of floating ice, or from being carried over boulders by the swiftly ebbing tide. The first drifted tree-trunks were found on the shore in latitude 60° 3′ 30″, probably not far from the mouth of Thlewiaza or Big river, and from that time firewood was quite plentiful along the shore.

The shore is almost everywhere low, with occasional bosses of granite or gneiss rising here and there above the water.

On October 1 we struck across the mouth of Button's bay, and at noon rounded the outer Churchill beacon. The tide was rushing out of the gap at the mouth of the harbour, and we were therefore unable to enter it until the tide had turned. About four o'clock we passed Old Fort Prince of Wales, and entered the harbour, and, just as night set in, we landed on the rocky point below the mission at Churchill. Here we were met by the Rev. Jos. Lofthouse, Captain Hawes, and Mr. Alston, and extended a hearty welcome. It was impossible to proceed further in canoes this year, and, as the rivers and larger lakes were not yet frozen, it was equally impossible to travel overland. We therefore accepted the very kind invitations of both the missionary and the fur-traders to stay with them during our necessary detention at Churchill. Our stay here not only gave us an opportunity of examining closely the geology of the district, but we were able to collect considerable information as to the length of time that the Churchill harbour is open for navigation. We also obtained from an Eskimo named Powow, and two Chippewyan Indians, many sketches, showing the geography of the country west of Hudson Bay.

In the winter of 1893, we had returned southward from Churchill by following the ordinary trade route along near the shore of Hudson Bay to York Factory, and thence by Oxford to Norway House. This year we decided to explore a new route, going directly from Churchill across country to Split lake, on the Nelson river, and thence by Cross lake to Norway House, a route especially interesting as being near the proposed line of the Hudson Bay railway. A team of five dogs was purchased from some Chippewyan Indians, who came in to trade at the store, and two Cree Indians were hired, with their own team of three dogs, to guide us across the country. The officer in charge for the Hudson Bay Company also agreed to send a dog-team with us to assist us in carrying our provisions during the first six days of our journey. The principal part of our load consisted of 1000 lbs. of provisions, 600 lbs. of which was for the dogs, and 400 lbs. for the men.

At daybreak on November 29 we bade good-bye to our kind friends, and started up Churchill river on our long tramp homeward. That day we walked without snowshoes on the ice, but early next day we left the river to the west of us, and, tying on our snowshoes, started across an almost treeless snow-covered plain, through which Deer river winds in a very sinuous channel. For five days we travelled across an almost level though gently rising plain, which is evidently very wet and boggy in summer. A rather steep escarpment, about 100 feet in height, rises to a total height of about 500 feet above the sea along the south-west side of this great plain, indicating the highest old marine beach, where the land stood nearly 500 feet below its present level. The -

the escarpment was lumpy, and probably consisted of sand-dunes, but the snow was too deep to allow us anywhere to see the ground.

The sled from Churchill turned back at this ridge, which is here about a day's journey within the limits of the continuous forest. The country south-west of the escarpment was lumpy and irregular, apparently underlain by till, and the snow was about 3 feet deep and very soft, so that the dogs had often more than they could do to haul the sledges even a few miles a day. We crossed some small lakes at the head of Owl river, and on December 8 reached a small tributary of Nelson river.

On December 12 we reached Musogetaiwi lake, where we saw the first rock in place since we left Churchill, the intervening country being evidently largely covered with drift. The next afternoon we reached Gull lake, on Nelson river, and from thence we ascended on the ice of the river to the trading port at Split lake, where we arrived on the morning of December 15. Here we obtained one fresh team of dogs, and then continued our tramp southward, reaching Norway House after dark on Christmas Eve, where four days were spent giving men and dogs a much-needed rest.

The remainder of the journey was down Lake Winnipeg to Selkirk, where we arrived on the evening of January 7, 1895, after an absence of six months and twenty-two days, during which time we had travelled 2900 miles, 1750 of which were in canoes, and 725 on snowshoes.

NOTE ON MR. J. B. TYRRELL'S MAP.—The work shown on this map helps to fill in the space between Mr. Tyrrell's two former journeys of 1892–93, an account of which appeared in the *Geographical Journal*, vol. iv. p. 437. Observations were taken at Du Brochet with the sextant and artificial horizon for latitude and the variation of compass. During the journey bearings were taken with the prismatic compass, a solar compass being used occasionally to correct the variation. When possible the latitude was observed daily, and a Massey's floating boat-log was employed to estimate the stretches of running water.

RECENT BOOKS ON THE UNITED STATES.

By ÉLISÉE RECLUS.

IT is said that the architect of the new library of Congress at Washington, warned by the masses of literature packed away in the cellars of the existing library, planned the new buildings with the purpose of making room for at least five million volumes. Nor is the estimate excessive, for the interminable stream of printed matter, including periodicals by the cart-load every day, threatens to fill the largest halls to overflowing. In this flood geography has a large share, and the special literature of the United States is increased every week by new works, good, commonplace, and valueless. Books of the first class are rare enough—

we are inclined to say fortunately, because the critic may find time to read them all and note their best points. The present article is concerned with the three most important works on the geography of the United States which have appeared in recent months.

The volume by Mr. J. D. Whitney * is merely an appendix to his earlier book, which was originally written for the *Encyclopædia Britannica*, but only published there in part, on account of its length. Being complementary to the previous work, this appendix naturally lacks artistic unity of design; but it is of great interest, notwithstanding, for it deals with the statistics of the last census, and especially because of the space given to the question of irrigation in the Great West.

It is well known that during recent years the extension of irrigation works has won great stretches of good agricultural land from the arid deserts of the western plateaux, and the full discussion of the question, fortified by detailed statistics, forms one of the best features of Mr. Whitney's book. Yet it must not be forgotten that irrigation schemes have given birth to many speculative companies, and that many fraudulent transactions on the Stock Exchange have been preceded by reports of irrigation works which, if not absolutely untrue, were at least greatly exaggerated. In the thinly peopled region of those arid lands, it is easier than in most places to start false reports for the use of distant shareholders. Companies were quickly formed, and disappeared no less rapidly, but out of the many vaunted enterprises some at least were sound, as the scattered towns growing up in the ancient solitudes sufficiently testify.

Artesian wells appear to have been remarkably successful in different parts of Texas; for example, those of Waco, where in 1891 nine wells discharged a total of 850,000 gallons per day. This water, coming from a depth of 1607 to 1896 feet, has a temperature of from 97° to 103° Fahr., and, although containing sulphates and carbonates in solution, is said to be "very pure and without appreciable taste." Near the town of Fort Worth artesian water wells up in abundance, sufficient to furnish a water-supply for a city of a million inhabitants. This water, too, according to Professor Hill, is "clear as a diamond and pure as melted snow," although a good chemical analysis would be more satisfying than the somewhat ambiguous metaphor. I must add that the "tall talk" natural to Americans, and especially to Western Americans, does not abandon them in discussing questions of subterranean hydrology. According to many of them, the melting snows of the Rocky Mountains, aided by the slight rainfall of the Great Plains, suffice to maintain a small ocean streaming under the superficial strata as "a mighty underflow" towards the Gulf of Mexico. Under every river, the Plate, the Republican, the Arkansas, they affirm that another and greater river exists, which the farmers of the future will probably be able to lead back to the surface. Mr. Whitney thinks—and with good reason, as we believe—that such hopes are in great part chimerical. Enterprises infinitely easier have only been executed imperfectly or remain mere projects; such, for example, as the 147 reservoirs which the members of the Irrigation Survey have planned in California and the western States. These would together have an area of 166,000 acres, and could store enough water to irrigate 1,900,000 acres of land;* but these vast works have not yet been undertaken. On the Upper Mississippi, several of the lakes and alluvial valleys which rise in successive tiers have been transformed by dams into reservoirs for the winter and spring floods, still it does not appear that these efforts towards regulating the river and maintaining its flow in dry weather have had appreciable results; besides, the lumberers who float timber down the Mississippi complain greatly that the regulated river has no longer a sufficiently rapid current at the time when it is most wanted for their work.

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* 'The United States,' Supplement I.—Population, Immigration, Irrigation.

The two volumes entitled 'The United States of America,' and edited by Professor N. S. Shaler, form rather an encyclopædia of North America than a methodical work presenting the various questions dealt with in their proper place and in due proportion. There is not even a consistent editorial plan. The editor has put together several chapters which are not always in logical order, and then left to others the treatment of special questions, or of matters which seemed to him of secondary interest. There are even some chapters which would be out of place in any but a purely financial work, as, for example, that on "The place of corporate action in our civilization." We regret, also, that the authors have introduced into a work of which science and art should be the principal objects, illustrations of banks, factories, workshops, locomotives, steamers, sheds. These unattractive pictures abound, and the work would have gained much by their absence. It would have gained, also, if it were not embellished by maps and pictures taken from other books, from which the titles and the authors' names have been removed. Nothing could have been easier, in the scientific surroundings in which the editor lives, than to prepare original maps and illustrations.

The most important chapter in Professor Shaler's part of the work seems to us to be that devoted to marsh lands. Almost all the lakes which formerly occupied hollows in the primitive glacial deposits have been gradually filled up. Excepting only those lakes the waves of which are strong enough to prevent the growth of sphagnum and other peat-forming plants, we find that the lateral creeks of such basins are diminishing. It may often be demonstrated that masses of muddy moss encroach on the water year by year as a sort of floating quay. Various species of rushes, water-lilies, and reeds grow thickly sufficiently far in front of the invading sphagnum to check the force of wind and waves, and so facilitate the growth of peat, which steadily advances. Seeds and broken vegetable matter fall to the bottom, which is gradually raised by the accumulation, and affords soil for the vanguard of growing vegetation. The lacustrine peat-beds of North America probably extend in cultivable regions to an area of at least 40,000 square miles, and may be entirely reclaimed by means of drainage and improvement. The important cranberry industry has lately developed on these old fresh-water marsh-lands. For this purpose the upper layer of peat is removed, and a bed of sand about 6 inches deep is spread in its place. The cranberry cuttings are planted at intervals of one or two feet, and in a few months they cover the soil with a continuous mantle of vegetation.

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* Report III. in Report of the Secretary of the Interior (52 Cong. 1st Session, Ex. Doc. 1, Part 5), containing Twelfth Report of the U.S. Geological Survey. Part II. Irrigation. 1892.

Like Mr. Whitney, Professor Shaler has a good deal to say about the effects of irrigation on agriculture in the Great West, and here he perhaps allows himself to be led astray by hopes which are not likely to be realized. It seems scarcely probable that, even counting the produce of the mines, "in twenty years from the present time the aggregate of commercial values which will be thus won from the great American desert will be as large as that obtained in any equal area of the continent."

We must also take exception to the author's statements about the French Canadians. Twice, on page 126 and on page 220, he asserts that the French Canadian race has a considerable mixture of Indian blood. This is not the case, as a very learned writer has clearly proved.* No doubt the French immigrants who first penetrated into the forests of the interior took native wives, but they allowed their children to remain with the mother's tribe, even when they did not lapse into savagery themselves. The native Indians were crossed with French blood, and in many places gave birth to the remarkable ethnic groups of "Bois-brûlés," whose assistance in opening up the Great West has been so important. But the French-Canadian colonists, as a whole, married amongst their own people. During the period from 1608 to 1663, young girls from twelve to sixteen years of age were recruited in all the parishes of France, and when the white population of Canada rose to 2500, the equilibrium of the sexes was almost established. Only seven marriages of Frenchmen with Huronian or Algonquian wives are recorded.

The attentive reader of Professor Shaler's work will find many controvertible points, but he will, perhaps, be inclined to find most serious fault with the author because of a certain want of magnanimity in the treatment of high questions of political morality. In such questions one ought not to be satisfied with dull and trivial phrases, so wanting in relief that the true meaning of them must be sought for with an effort.

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* Benjamin Sulte, 'Prétendue origine des Canadiens-Français.'

The penultimate chapter at least, on "The place of the individual in American society," prepared by Mr. Lyman Abbott, leaves nothing to be desired as a sincere and bold discussion of the subject. This fine chapter is thoroughly impartial in its tone, and quite free from the boasting spirit so natural in a people which has made such vast and rapid strides in material prosperity.

The second edition of the second volume of Professor Friedrich Ratzel's book on the United States* is a work of the first order, admirably sustaining that high reputation which all his earlier works have won for their author. It is far from being a reprint of the first edition; originally prepared with scrupulous care, it has been corrected in the most conscientious manner. The statistics have, of course, been completely revised; but, besides that, the author has throughout given increased attention to the importance of the study of environment as well as race. He treats his subject in a strictly logical order; perhaps he has made it a little too much of a text-book, as if it were prepared to assist students to pass an examination, and the style is a little dull and colourless, not always even as clear as one could wish. Naturally, all the maps in the text and the Kultur-Karte at the end of the volume are specially engraved from original draughts. Taken as a whole, Ratzel's work must be considered a classic, perhaps the best and most complete treatise on the United States in any language.

Without taking notice of many small details which might be touched upon, we limit ourselves to calling attention to pages 172 and 173, in which the author speaks of the feeling for nature. He very rightly rebukes de Tocqueville for having denied the deep love and filial poetic feeling which most American authors display for their lakes, rivers, forests, mountains, and the thousand charms of the land they dwell on and the air they breathe. He cites the names of Cooper, Hawthorne, Bryant, Lowell, and above all that of the incomparable Thoreau. He might have mentioned equally well the delightful towns, the streets of which are married to beautiful gardens, flowery turf, and wooded fields. But if on one side he recognizes in the poets their deep respect for the beauties of nature, should he not, on the other, have referred to those industrial and business men—personages who bulk so largely in American society—whose contempt for nature is complete? There are few countries which are made hideous with a lighter heart than America. Its mines, factories, railway stations, make one fear that the nation is suffering from a barbaric suppression of the æsthetic sense analogous to the exhaustion of the soil. One recalls with a kind of horror some Oilville or Ironopolis, with its maze of intercrossing rails, its mounds of coal and slag, hideous buildings, derricks, sheds, its grimy hotels and filthy drinking-shops garnished with dingy banners.

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* Friedrich Ratzel, 'Politische und wirthschaftliche Geographie der Vereinigten Staaten von Amerika.'

Niagara City perhaps inspires the most painful feelings of the contrast between the fine sentiment for nature cherished by the poets, and the absolute contempt for beauty displayed by the mill-owners. On one side, fair woods and lawns respectfully surrounding the cataract; on the other, a frightful crowd of breweries and factories monopolizing the cliff and defiling it with their disgusting outflow.

A JOURNEY IN PERSIAN KURDISTAN.

By WALTER B. HARRIS.

I LEFT Tabriz on May 12 of this year (1895), and, skirting between the slopes of Mount Sahand and the shores of Lake Urumia, passed the famous "marble springs" on the 14th, and some few hours later arrived at Maragha. This town possesses about 18,000 inhabitants, and was once one of the many residences of Hulaku, the Mongol chief (died 1265 A.D.); but I failed to detect the remains of the observatory of Nasr ed-Din, said to have been situated on a hill near. The tomb of one of Hulaku's wives was shown to me. It is a high octagonal brick tower with some very delicate and beautiful work in faïence, and an inscription in blue tiles encircles the summit just below the dome. The building is elevated on a stone foundation. Within is a large stone chamber with well-faced walls. The viceroy and heir apparent, the Vali-aht, tried to throw down the tower in his search for treasure when he visited the spot some few years ago, but the skill of his workmen failed to do more than barely move one stone.

From Maragha I proceeded to Suj-bulak, *viâ* Miandab, which mud-built town is even now almost entirely in ruins owing to the Kurdish invasion in 1880 under Obeidullah. Suj-bulak is a bright, picturesque little town almost entirely populated by Kurds, whose gorgeous clothing and pleasant manner add a charm to the place. Here I first obtained an insight into the kindly hospitality I was to receive all through Kurdistan. I may add that I was not armed with any letters or official papers of any sort from the Persian Government, and this, I venture to think, aided me not a little.

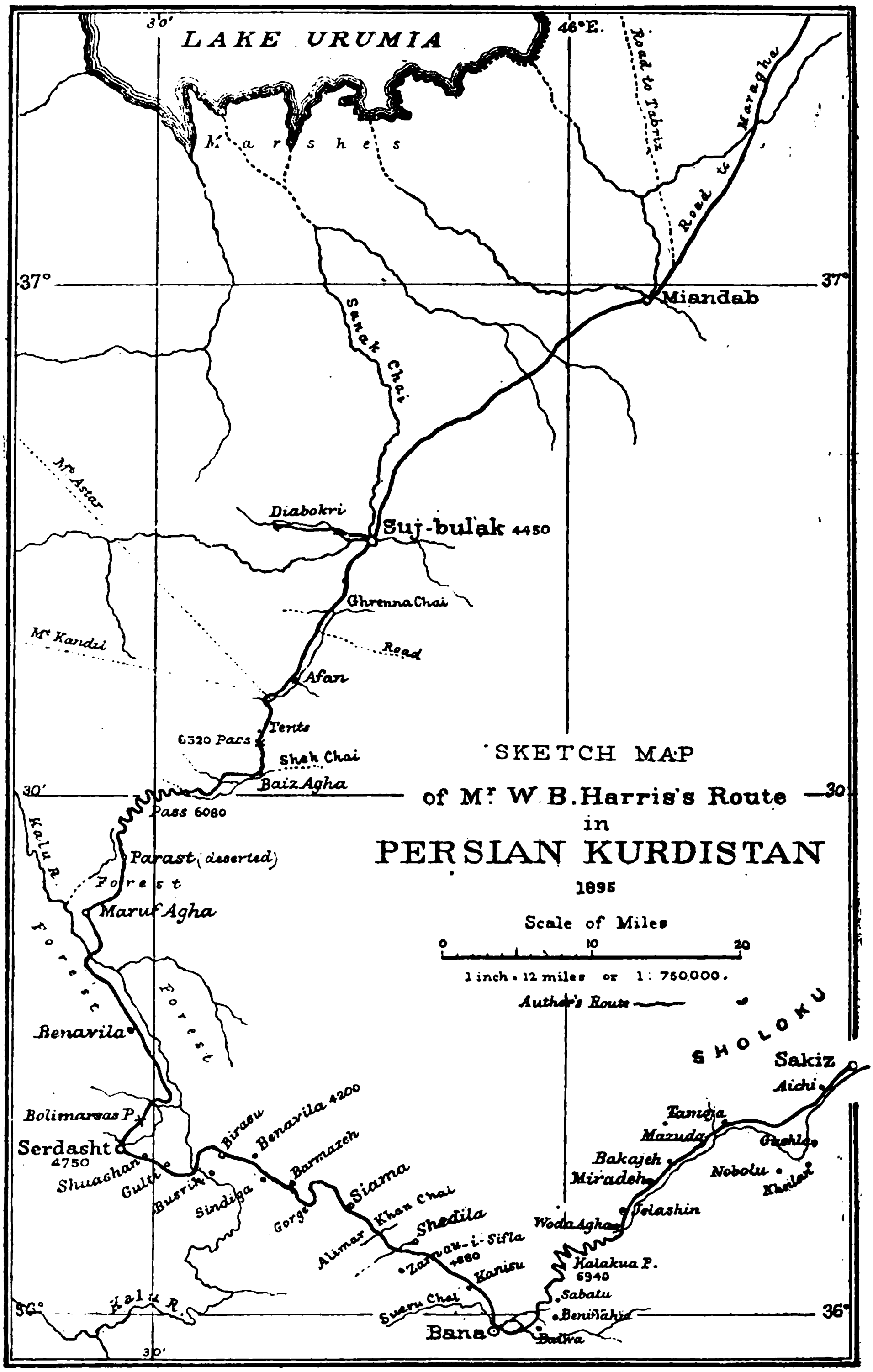
After having made an excursion to the house of a Kurdish chief in the neighbourhood, I left Suj-bulak, with a Kurdish guide and my

Turki and Arab servants, for Serdasht on May 20. Instead of following the caravan road, I struck straight across the mountains, for the purpose of seeing the Kurds in their summer quarters. The road for the first day offered no very distinctive features, passing through green pasture land, and scarcely a village to be seen. Towards nightfall we began to ascend, and spent the night with some Kurdish shepherds in their tents at an altitude of about 6000 feet above the sea-level.

Early next morning we crossed this ridge of hills at an altitude of 6520 feet, and, descending by a winding gorge, reached the Sheh Chai, where we breakfasted in the tent of Baïz Agha, a Kurdish chief, the nephew of the celebrated Gader Agha, head of the Mangur tribe. In the afternoon another high ridge of grass-covered hills was crossed, here and there rocky precipices being visible. The ridge was crossed at an altitude of 6080 feet above the sea-level.

A magnificent panorama of the Kalu valley opened out from here, range after range of hills both sides of the river covered in forest, with a background of the high snow-peaks that mark the frontier between Turkish and Persian territory. Descending by a winding path through lordly forest country—principally the Kurdistan oak—we passed the now deserted village of Parast, and spent an hour later on in the hospitable house of Maruf Agha, another chieftain. I should have stated before that I had none but the scantiest luggage, and depended entirely upon the hospitality of the Kurds for food and lodging.

The Kalu river, marked as Kalvé in some maps, flows at this spot nearly north and south. The ford was difficult, but with the aid of half a dozen volunteers and swimming, we got across. Keeping to the right bank of the river, the night was spent at Benavila, a most picturesque and hospitable village in a lovely gorge of forest trees. Music and dancing were got up for my entertainment, together with a big feast. The following day (May 22) we travelled for an hour and a half along the bank of the river, now through cultivated land, and again through jungle of trees and yellow roses, and then ascended by the Bolimarsas pass to Serdasht, which was reached before noon. The town is a small place, situated high above the right (west) bank of the river, commanding a magnificent view of the valley, forest, and peaks beyond. So overgrown are the roofs of the houses with grass, that until one is almost within the streets one does not perceive a single habitation. The population of Serdasht probably does not number more than two thousand people—all Kurds. From this spot a road runs to Suleimaniyeh, in Turkish territory, whence there is a caravan road to Baghdad; but the country between Suleimaniyeh and Serdasht is very unsafe, on account of the depredations of the frontier tribes. A feast was taking place in the little town, with music and dancing. I found Serdasht to be situated some 4750 feet above the level of the sea. Suj-bulak I made 4450 feet, and not 4750 feet, as Mrs. Bishop states in her book. My


SKETCH MAP
of Mr W. B. Harris's Route
in
PERSIAN KURDISTAN
1895
Scale of Miles
0
10
20
1 inch = 12 miles or 1 : 750,000.
Author's Route
LAKE URUMIA
30'
46°E.
Marshes
Road to Tabriz
Road to Maragha
37°
Miandab
Sanak Chai
Mt Astar
Diabokri
Suj-bulak 4450
Ghrenna Chai
Mt Kandil
Road
Afan
Tents
6320 Pass
Shah Chai
Baiz Agha
30'
Pass 6080
Parast (deserted)
Forest
Maruf Agha
Kalu R.
Forest
Forest
Benavila
Bolimarvas P.
Serdasht
4750
Shuashan
Gulti
Busrik
Birasu
Benavila 4200
Sindiga
Barmazeh
Gorge
Siama
Alimar
Khan Chai
Shedila
Zanvah-i-Sifla
4880
Kanisu
Sweru Chai
Kalu R.
36°
30'
Bana
Batwa
Benivahie
Sabatu
Kalakua P.
6940
Wodu Agha
Jelashin
Miradeh
Bakajeh
Mazuda
Tamoja
Aichi
Sakiz
SHOLOKU
Gushla
Nobolu
Khailan
36°

barometer was set at Batum, and corrected to Tabriz, taking the elevation of the latter at 4300 feet, which is agreed by the European inhabitants to be correct.

On May 23 I left Serdasht early in the morning, and, descending by a path in an execrable state on the south side of the Bolimarsas gorge, crossed the Kalu an hour later on a boat of timber and inflated skins, an exciting but none too safe passage of so turbulent a stream. Ascending on the east bank, we passed many picturesque villages, and entered an undulating plateau with exquisite scenery of park-like nature, here undulating green sward, and there dense forest of oak trees—the whole set to a background of rock and snow-peaks. Toward noon we breakfasted at the village of Benavila, on the plateau, at an elevation of 4200 feet—1000 feet above the bed of the Kalu river. Beyond this village the road continues level for about an hour and a half, when suddenly one comes across a deep gorge, through which flows a torrent, a tributary of the Kalu. A descent of over 1000 feet down the steep cliff was accomplished with no little difficulty, and then the other side had to be climbed. The whole gorge is dense forest, and very beautiful. The summit of the south side I found to be 4600 feet above the sea. This spot is known as Gamerjaz. The road still continued to ascend, and we pursued our former direction of south-east to Siama, a large village lying in what resembles the bed of a former lake, surrounded by hills and mountains. Here again the Kurds had never seen a European, but were most hospitable and polite, housing me in the village mosque, which they carpeted for the occasion, and lit a huge fire in the grate, for it was cold. In the neighbourhood are some curious mounds, about which the natives have traditions. I obtained some antiquities—coins, and seals, and cylinders.

On May 24 we crossed the Alimar Khan Chai, and continued through the districts of Mahmul and Shedila. The range here is known as Nuasger and Kanisu. Passing the large village of Zarnau-i-Sifla (4880 feet), and fording the Sueru Chai, we reached Bana about midday. Bana is a small town, with, like Serdasht, a Kurdish governor, and few or no inhabitants except Kurds. Again the hospitality shown me was very great, though I possessed no letters and no recommendations. Bana probably possesses from two to three thousand inhabitants.

I left Bana on May 25 at midday, and three hours later crossed the mountains to the north-west at an altitude of 6940 feet. Snow was lying at this spot, and at places the road was covered with it. Descending by the bed of a torrent on the opposite side, I spent the night at Miradeh, where, although the natives are Kurds, Persian style of architecture is found. We had left all the forest behind now, and reached an agricultural part of the country; nor were the Kurds so fine in appearance or character as in the valley of the Kalu. During the afternoon of May 26 I reached Sakiz, a small town on the Sinna-

Suj-Bulak caravan road. There is nothing of great interest to be seen, and the place is a very poor one.

From Sakiz to Sinna took us three days good travelling, for the most part on a high grassy plateau. The road takes a south-easterly direction for about half the distance, and then turns more directly south. The inhabitants, though still Kurds, have had most of their spirit crushed out of them by Persian oppression. The road possesses no difficulties, but is often the scene of violent robberies by the frontier tribes, who make these desolate plateaux their hunting-ground for spoil. The Khorkhora and Kizil-Uzen are the two large rivers crossed, but neither presents much difficulty in fording.

Of all the towns I saw on my travels, Sinna, the capital of Persian Kurdistan, is the most charming. Not only are its inhabitants most hospitable, but the climate and surroundings perfect; and during my stay I was treated as a sort of public guest, though again possessing no letters of introduction and recommendation. As in all the other towns mentioned, there are no European residents at Sinna. From Sinna a couple of nights of hard riding—on one of which we lost our way, and sat from 1 a.m. till dawn on the edge of a precipice—and Kermanshahan was reached. After a friendly rest there, I pursued my journey to Baghdad, where I arrived in the middle of June.

LIST OF KURDISH TRIBES IN PERSIAN KURDISTAN.

In the Vicinity of Sinna.

Telaku.
Beliloan.
Galbari.
Kumassi.
Orami.
Merivan.
Manumi.
Perpéshai.
Lali.
Zan.
Meraki.
Burakaïi.
Shamasuri.
Sheikh Ismail.
Gurgei.
Duraji.
Petiariwan.
Khoileshari.
Jafakobadi.
Braz.
Sagaru.
Sagwan.
Lakh.

In the Vicinity of Sakiz.

Horhora and Eldi.

The Jof and many really Turkish tribes frequent the mountains near Sakiz in summer.

In the Vicinity of Suj-Bulak.

Mangur.
Govrik.
Malkeri.
Darmai.
Allani-Dulikan.
Baski-Kolastah.
Kuluii.

In the Vicinity of Bana.

Tarjani.
Dashtatali.
Ikhtiari Dini.
Huein Beg.

Note.—The above is the only geographical manner in which it is possible to arrange these Persian-Kurdish tribes, as, owing to several often inhabiting the same regions, and their summer migrations to the mountains, they cannot be satisfactorily placed.

KILWA ISLAND, IN LAKE MWERU.*

By A. BLAIR-WATSON, Collector of Revenue, Mweru District.

KILWA island is triangular in shape, and lies in the south-west angle of Mweru lake, the apex of the triangle pointing towards the Luapula mouth. It lies much nearer to the west coast than to the east, the nearest point of the mainland being within 5 miles of the north-west corner of the island. It has an area of about 25 square miles. Except at two points, there is a belt of low-lying land along the shore, the interior being raised 200 to 300 feet, in three ranges of low hills; at these two points the hills run right down to the lake, ending in abrupt overhanging cliffs. The Red cliffs, mentioned in Mr. Sharpe's map, form one of these points, at the southern end of the island; at the north-west corner the cliffs are of limestone, and in these are the caves described beneath.

From the lake, at some distance off, the island appears very beautiful. The lower slopes of the hills and the low-lying lands beneath are thickly wooded, forming a fringe of forest round the coast. Above the tops of these trees appear the grass-covered hills, almost entirely destitute of trees, and, at a little distance, resembling downs in their smooth, undulating surface. When close, however, they are seen to be rough with rock and boulders, and the grass to be several feet in height. The scenery on the island is equally charming, though, except for the number of palms, palmyra, and the oil palm, not distinctively tropical. Of the hills, one range occupies the north-west corner; Simba's town stands close under them, in a bay facing north-west. The other two ranges occupy the north-east and south-east portions of the island, lying somewhat near the shore. Between these hills and the first range a broad flat runs right across from the north to the south shore. There are several small streams. The ground is exceedingly fertile, and seems to grow everything well. I have nowhere seen better Kafir corn, of which grain a large quantity is grown. There are also extensive rice-fields extending fully a mile along the shore. Palm trees are very numerous, the palmyra and the oil palm; hyphæne I did not notice. The palmyra grows chiefly along the lower slopes of the hills, and the oil palm is found in most abundance along the courses of the streams. Large quantities of palm oil are prepared by the natives, and a certain amount of trade used to be done in it on the east side of Mweru, where the tree is not found. I have no doubt they would grow here, and while at Kilwa I procured seeds, and have distributed some among the various chiefs in the district, in addition to planting some at Rhodesia.

The coast-line is surrounded generally by a dense marshy growth extending far out into the water, rendering landing from a boat very difficult except at a few places where a break in this growth is found. Much of this vegetation, with which some of the small bays are choked up, doubtless comes from the Luapula river; floating islands of grass and papyrus, some of very considerable size, are brought down by the river in flood, and are constantly met with on the southern portion of the lake.

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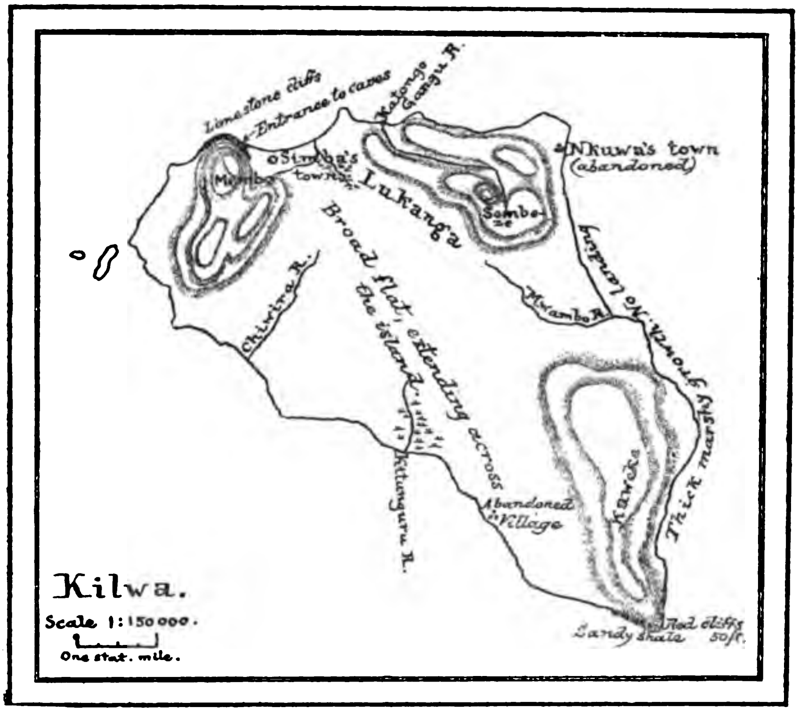
* Forwarded by H.M. Commissioner for British Central Africa, H. H. Johnston, C.B

The " Red cliffs " form a promontory at the south end of the island, and extend for a total distance of about half a mile, with a height of 50 feet. The rock is a fine sandy shale very regularly bedded in layers from 2 to 4 inches in thickness, which separate easily, and would make admirable tiles for paving. The strata run horizontally.



The range of hills forming the cliffs at the north-west is mainly limestone. The greater part of this stone is impure, containing a considerable percentage of sand; indeed, some of the rock outcropping on the hill is rather a calcareous sandstone than a limestone proper. There is a considerable amount, however, of a purer limestone, which, burned, made very excellent lime. In the face of the cliff, half a mile west of the town, is the entrance to the series of caves and passages occupying the interior of the hill "Membo." These passages tunnel the hill to a great depth, and have a total length of many hundreds of yards. There is but one entrance, and this passage, not of large dimensions at the mouth, diminishes further as it runs in, reaching its narrowest point about 40 yards in, where it is no more than 4 feet high and 3 feet broad. Beyond this point the passage widens, expanding at intervals into chambers. Branch passages also, similar in formation, are frequent, opening on both sides of the main passage. The latter terminates in a large vaulted cave lighted from a chimney-like opening through the roof, the exterior aperture of which is near the top of the hill. During the time Mshidi was raiding the west coast of Mweru and Kilwa island, several hundred natives were living in these caves.

Of game birds I saw guinea-fowl, partridge, and quail. Of antelopes there is but one, closely allied to the sitatunga (*Tragelaphus spekei*), but, I believe, a new species. The sitatunga, which is found along the southern shore of Mweru, and the lower marshy reaches of the Luapula, is well known to the natives under the name of "nje," and its horns may be seen in most of the lake and river-side villages. The natives agree in calling the Kilwa antelope a different species, and give it the name of "nzowi." The horns seem to be longer than the sitatunga's, with a different annulation, and from the pieces of old skins which were shown me, the adult animals, the males at least, seem to retain the usual tragelaph markings, which are said in the sitatunga to be lost on the animal attaining maturity. I have arranged that a representative pair of horns and male and female skins shall be kept for me at the time of the annual hunting, which takes place when the marshy vegetation fringing the island is dry enough to burn. I was told that when it is decided to set fire to this, powder is served out to all the men of the village, and an organized hunt takes place, both by canoe and on land, and that large numbers are killed annually on the few days this hunt goes on. It is only on the rarest occasions that one is seen or killed at any other time.

GEOGRAPHY AT THE BRITISH ASSOCIATION, IPSWICH, 1895.

The year 1895 will be memorable in geographical circles on account of the great International Congress, which attracted to London an assemblage of specialists in geography from all parts of the world, such as had never been brought together before. British Geographers accepted their position as hosts of their foreign colleagues in no grudging spirit, and in particular the Fellows of the Royal Geographical Society gave liberally of their money and time to make the meeting a success. The remark was more than once heard at the Congress that this year's meeting of Section E of the British Association at Ipswich would be a failure, as the meetings of July and August were providing enough matter for thought to satisfy the most enthusiastic geographers. The Ipswich meeting has not been a failure, however, and the stimulus of the Congress was traceable in more than one of the papers offered. It cannot be denied that the attendance of well-known men whose names usually swell the list of the sectional Vice-presidents and Committee was smaller than usual, but the average quality of the papers was high, and the popularity of the Section undiminished.

The following is the official list of sectional officers:—

President:—H. J. Mackinder, M.A. *Vice-Presidents*:—Major L. Darwin; Col. H. H. Godwin-Austen, F.R.S.; Sir Joseph Hooker, F.R.S.; J. Scott Keltie; John Murray, D.SC.; E. G. Ravenstein. *Secretaries*:—John Coles; H. N. Dickson; H. R. Mill, D.SC. (*Recorder*); W. A. Taylor, M.A. *Committee*:—W. B. Blaikie; John Bolton; G. F. Scott Elliot, M.A.; Dr. H. O. Forbes; Dr. P. L. Sclater, F.R.S.; Eli Sowerbutts; G. J. Symons, F.R.S.; Coutts Trotter.

The Presidential address, which was printed in the October number of the *Journal*, was received with close attention, and warmly approved by the Section. The subject of geographical education is no new one at these meetings, but it is safe to say that never before has it been treated with such knowledge and practical directness.

The ordinary work of the Section proceeded in the usual way. In spite of the regular adjournment over the luncheon-hour, the attendance was very irregular, more than one of the best papers being read to audiences of less than fifty; but on a few occasions the hall was crowded by more than four hundred people. Only a few of the papers were adequately discussed. In some cases the absence of the authors, in others the length and irrelevance of some of the speakers, robbed the Section of a profitable discussion. The quality of the papers was above the average, although in number they fell below former years. A few were original communications; but, as usual, the greater number dealt with subjects already treated of at less general gatherings.

On Thursday, September 12, after the President's address at 11 a.m., Mr. H. S. Cowper gave a preliminary note on his recent journey through Tarhuna and Gharian, in Tripoli, of which a full account will be submitted to the Royal Geographical Society. Mr. Miller Christy read a short paper on Rockall, summarizing the scanty knowledge of that islet which we possess, and urging the importance of visiting the rock and studying its geology and fauna. He suggests that this would be an excellent expedition for an adventurous yachtsman. Rockall lies 185 miles west of St. Kilda, the nearest land, and it appears never to have been properly examined, the common statement that it is composed of "black granite" being an incidental proof of this. A brisk discussion on the value and practicability of Rockall as a meteorological station arose, in which Mr. G. J. Symons, Mr. Coles, Dr. H. R. Mill, and Mr. H. N. Dickson took part.

A paper by Dr. A. Markoff on "Western Siberia and the Siberian Railway," was communicated in the absence of the author.

On Friday, September 13, Mr. C. E. Borchgrevink gave a short account of his voyage to Victoria Land, and detailed his plans for an expedition to the Antarctic Regions, which he hopes to conduct from this country. He held, from his observations during the voyage of the *Antarctic*, that there were commercial possibilities in the direction of guano, minerals, and probably whales, as well as seals in high southern latitudes. Sir Joseph Hooker spoke of his experiences in Sir James Clark Ross's expeditions, and stated that he had been struck by the close resemblance of the photographs brought home by Mr. Borchgrevink, to the sketches made in Ross's ship. Sir William Flower described the varieties of whales in the Arctic and Antarctic Regions, and spoke of the seal-hunting in Bering sea. He deprecated the attempt to combine scientific observation with commercial pursuits, and strongly urged that any future expedition for research should be purely scientific. Dr. John Murray also spoke in the discussion.

Mr. H. N. Dickson gave a paper on "Oceanographical Research in the North Atlantic," in which he showed, by a series of isothermal maps for the surface of the ocean, and the isobaric maps for the same period, that a close relation subsisted between the temperature of the water and the distribution of air-pressure on which the climate and weather of Western Europe depend. It was pointed out, in the discussion of this paper, that the union of oceanography and meteorology promised in this direction to be productive of results of practical importance. The lantern-slides illustrating the paper were much admired.

Dr. John Murray gave a short paper on "Oceanic Circulation," in which he reviewed the conclusions to which the discussion of the *Challenger* results had led him.

On Wednesday afternoon Mr. J. L. Myres read an ingenious paper on the "Maps of Herodotus," an abstract of which appeared in the Monthly Record. The subject is one which seems worthy of further study, and the method employed might possibly be extended to the interpretation of the works of other early writers.

Mr. W. B. Blaikie demonstrated the use of his cosmosphere, which he has much improved since he exhibited it at an afternoon meeting of the Royal Geographical Society.

Major Darwin read a short account of the Sixth International Geographical Congress, and referred to the resolutions adopted by it.

Monday, September 16, was largely devoted to Africa, but, on account of the hall being required for a meeting of the General Committee at 3.15, none of the papers were so fully discussed as they deserved to be.

Mr. G. F. Scott Elliot described his journey to Ruwenzori, and gave some account of the physical condition and resources of eastern tropical Africa. The main facts regarding this journey are already familiar to our readers. The paper was illustrated by fine lantern views.

Mr. E. G. Ravenstein submitted the "Report of the Committee on the Climate of Tropical Africa," the text of which was printed in the Monthly Record last month.

Captain S. L. Hinde described his experiences in the outlying parts of the Congo State; and a paper by Mr. J. T. P. Heatly (an abstract of which appeared last month) on the "Port of the Upper Nile in relation to the Highways of Commerce" was read in abstract by Mr. W. A. Taylor.

Mr. A. Montefiore gave a preliminary account of the voyage of the *Windward* with the Jackson-Harmsworth expedition to Franz Josef Land, and of her return to Vardö after landing the exploring-party. Her arrival in that port coincided with the meeting of the Association, and as there were only somewhat meagre telegrams to go upon, full details of the journey could not be given at that time.

Mr. A. Trevor-Battye gave an interesting paper on the "Struggle for Existence under Arctic Conditions," in which he entered deeply into the fascinating subject of bio-geography, investigating the influence of geographical environment on the birds of the Arctic Region in particular.

The Rev. W. Weston described his explorations in the Japanese Alps between the years 1891–1894, during which he studied the mountains mainly as a climber, but also found time to make valuable observations on the flora, fauna, and especially on the people, who preserve many curious customs that have passed away in the less isolated parts of Japan.

Thursday, September 17, saw the work of Section E concluded with a set of papers dealing exclusively with Asia.

The "Report of the Committee for the Exploration of Southern Arabia" was read by the secretary, in the absence of Mr. Bent, who had drawn it up.

A paper on Formosa, by Mr. John Dodd, who was unable to be present, was read by Mr. Dickson. This paper gave an account of observations and explorations in the island of Formosa made by the author during his residence there from 1864 to 1890. After referring to the work of British naval officers, consular officers, commissioners of Chinese customs, and others, and giving a general geographical description of the island and its commerce, Mr. Dodd went on to discuss the probable origin of the aboriginal tribes occupying the highest mountain districts. The mode of life of the savage inhabitants was described—their dress, weapons, methods of hunting, marriage customs, etc.—and special reference was made to the practice of head-hunting, whether indulged in from motives of revenge or merely as a pastime. The paper next dealt with the Pepawhano, or descendants of the savages of the plains, their spoliation by Chinese immigrants, and the work of the Dutch missionaries amongst them. In the concluding section the author referred to the colonization of parts of Formosa by immigrants from Fokien, and to the Hakka invasion of the hill districts. Some account was given of the opening up to foreign trade, especially in camphor, coal, and tea, and an estimate was formed of the commercial resources of Formosa and of the prospects of their development. Mr. Dodd sent a special map of the island, and a number of water-colour sketches, which were exhibited in illustration of his paper.

Dr. A. Markoff read two papers, one on the "Russian Possessions in Central Asia" and the other on the "Towns of Northern Mongolia."

Mr. J. L. Myres finally gave an account of his recent researches in Caria, in Asia Minor.

After the usual vote of thanks to the local committee and the sectional officers, the Section adjourned until the meeting in Liverpool in 1896. On this occasion the preliminary work of the Recorder in arranging for the papers to be read was mainly done for him by Mr. H. N. Dickson, who volunteered his assistance, and carried out the arrangements most efficiently.

Two committees suggested by the Section were appointed by the Committee of Recommendations. One of these was the reappointed Committee on the Climate of Tropical Africa. The other, under the chairmanship of Mr. Mackinder, with Mr. Herbertson as secretary, and Mr. Keltie, Dr. Mill, and Mr. Sowerbutts as members, was appointed to investigate the teaching of geography in Great Britain.

The Section unanimously resolved to request the President to write a letter of condolence to the father of the late Mr. Joseph Thomson, expressing the high esteem in which his work is held, and the affection with which his memory is regarded by his fellow-geographers. They also authorized a letter of congratulation to Dr. John Murray on the completion of his labours on the *Challenger* reports. A similar compliment was paid to Dr. Murray by Section D, Biology; but, doubtless by accident, the address of the President of the Association omitted any notice of the magnificent results of the *Challenger* voyage, when touching on the landmarks of geography since 1831.

Papers of geographical interest were not confined to Section E. In Section A there were several communications on meteorological subjects, which, in the opinion of some, might profitably be transferred to the Geographical Section, where climatology is already naturalized. Many papers in Section C (Geology) involved a good deal of geography, especially those dealing with volcanoes, earthquakes, glaciers, coral reefs, and lakes. Section D (Zoology) opened with an address by Professor Herdman on "Oceanography," which was more geographical than some past presidents' addresses in Section E; and this was followed by several papers on distributional zoology, including the influence of geographical environment. In Section G (Mechanical Science) there were papers on the growth of the port of Harwich, on the action of wind and atmospheric pressure on the tides and on floods, as well as a most interesting description by Lieutenant B. Baden Powell of a new principle of aërial navigation, which he illustrated in the field by rising to a height of 50 feet in a car attached to a train of kites. The affinity of Section H (Anthropology) to Section E is very close; and the new Section K (Botany) has also its problems of a largely geographical nature. Several of the excursions proved of interest geographically, and perhaps none more so than that to the Colne oyster fisheries under the leadership of the Mayor of Colchester.

Thus, it is well to remember that "Geography at the British Association" is a considerably wider title than "The Proceedings of Section E."

AFRICAN ETHNOLOGY.

By E. HEAWOOD, M.A.

In proportion as the purely geographical features of the African continent become well known, the attention of investigators is directed to more special branches of inquiry, such as (among others) those relating to the life of the inhabitants, their origin, migrations, etc., to which subjects an increasing number of publications are devoted.

The work lately brought out by M. de Préville* is concerned with the various types of society in Africa, and the causes which have occasioned their present condition and distribution. The general physical and climatic conditions of the habitat, being the most potent factors in the process of differentiation, the continent may be divided into four social, corresponding to the main physical, subdivisions, viz. those of the deserts of the north and south, the central plateau, and the mountainous region of the east. The first is the home of pastoral races, subject to the patriarchal rule generally associated with deserts. Even within its limits the type of society varies, according as the increasing humidity on either side of the tropic permits the camel to be replaced by horses, goats, or cattle, and according to the special industries (*e.g.* that of transport by caravans, the collection of gum, or the manufacture of goats'-hair fabrics) carried on in each zone. The cultivable oases are inhabited by a race marked by its activity and power of expansion. The fact that the four types here met with are observable also in South-East Asia favours the idea that they have descended, like great rivers, from a common home in that continent.

The grassy uplands of the eastern region have been peopled from the north-east by races whose special form of pastoral life, entailed by a necessity for annual change of pasture-grounds, leads to a threefold division into elders, herdsmen, and soldiers. The custom of inheritance by the eldest-born prevails. The disorganized tribes, dislodged from the plateaux, support themselves in the lowlands by hunting and the cultivation of the plantain, and are easily subjugated by their more energetic neighbours.

In the southern region pasturage again forms the staple industry, variations of society, however, following those of climate and rainfall. A new element has here been introduced by the advent of Europeans. In the central region the chase has exercised the most important influence, cattle-rearing being prevented (on any large scale) by the climate and the presence of the tsetse fly. Dependent on the chase is the trade in ivory, and, as its result, that in slaves also. M. de Préville subdivides this region according to the prevailing forms of cultivation by which the products of the chase are supplemented, the differing potentialities of different districts having probably influenced the direction of the various Bantu immigrations. The region of manioc—a product peculiarly adapted for the support of hunting tribes—occupies the whole southern Congo basin, and adjoining regions on the West Coast. That of the *eleusine* follows, with its head-quarters in the Niam-Niam countries, whose inhabitants possess a grain—poor, unpalatable, it is true, but providing a resource for the seasons of scarcity to which hunting tribes are always liable. Still further north is the region of durra, where the diminution of rainfall allows the cultivation of a more valuable cereal. A special place is occupied by the herdsmen and cultivators of the White Nile. In each of these subregions the author traces the particular way in which the mode of life reacts on society, showing, *e.g.*, how the Monbuttu, socially influenced by the harvest of the plantain and oil-palm, are formed into powerful clans, while their hunting neighbours, the Niam-Niam, exhibit only feebleness and division. That the former, with their rich plantain-groves, are cannibal no less than the latter, may perhaps be due to the contempt for outsiders naturally fostered by the clannishness just noticed. The vice is not found in the regions of manioc or durra.

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* 'Les Sociétés Africaines.' Paris, Firmin-Didot.

The social facts observable may help us, M. de Préville thinks, to attack the problem of the origin of the races, especially difficult in the case of the negroes; and his conclusions, though largely based on hypothesis, are certainly ingenious and plausible. The most striking characteristic of the negro race is the absence of the patriarchal *régime*, which shows, in his opinion, that in its migrations from the primitive home of man it has always remained exempt from the social state imposed by deserts. Two routes from Asia to Africa satisfy this condition, one by Palestine and the Nile, the other by the Euphrates and the coasts of Arabia. They converge on the region of the Upper Nile, which on independent grounds has been seen to be the point of divergence of the various branches of the negro race, the two main types of which may be held to represent the immigrations by two routes. The author does not despair of the ultimate social regeneration of the negroes, when once the slave-trade is abolished. For this he looks not to the whites, who tend to profit by, and not to remedy, the inferiority of the negro, but rather to those of his own kin who have attained a higher social level in the United States and elsewhere.

The title of the second book we have to notice* is somewhat misleading, for it is only the fourth and last section which treats of the negro races of the Egyptian Soudan in detail, the first three being devoted—(1) to a sketch of the general geography of that region, its physical features, flora, forms of cultivation, etc.; (2) the general characteristics of the population, including the Arab tribes of Darfur, Kordofan, etc., whose contact with the negroes has been fraught with such baleful consequences to the latter; (3) a historical sketch of the course of events from the time of Mehemet Ali, through that of the earliest trading settlements and the occupation by Egypt, to the Mahdi revolt and its results. The book, therefore, to some extent lacks unity of plan. It does not lay much claim to originality—in fact, the author is careful to avoid speculative questions—but its value rather consists in the fact that it presents in a small compass (but in greater detail than is possible in a general work such as Ratzel's) information which can only be found otherwise scattered throughout the works of many travellers. It may suffice here to refer briefly to the section dealing with the negro tribes.

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* 'Die Heiden-Neger des ägyptischen Sudan,' by H. Frobenius. Berlin, Dietrich Reimer. 1893.

The general characteristics noticed by the author—the effects of the plurality of wives and large families of the chiefs, leading to intrigue and division in the state; the value which attaches to the possession of women, and the kidnapping expeditions and feuds which result; the childish nature of the negro and his delight in jest; the prevalence of superstition and absence of higher belief—are more or less common to the whole negro race. Of more special application are the notes on the industries and arts of the tribes, a survey of which, in conjunction with their physical and linguistic characters, is some help towards a provisional classification into natural groups. This the author attempts, while avoiding hasty conclusions as to their origin or affinities. The first group he entitles the swamp-negroes, embracing the Shuli, Shilluk, Dinka, Bari, etc., marked by a lank stature, dark colour, and very pronounced prognathism. Next come the Bongo, Mittu,* Krej, etc., inhabiting the northern slope of the watershed between the Congo and the Nile. In spite of considerable differences, they show a decided connection with one another as opposed to the former group, none of them keeping cattle, and all marked by a reddish hue, while iron-working is universally practised, favoured by the amount of that metal in the soil. South of the watershed come the groups of the Zande, or Niam-Niam, with tall muscular forms and fine features, and the Monbuttu practising the rite of circumcision, and in the form of skull recalling the Semitic type. The former are a mixture of heterogeneous tribes, over which the Zande proper have asserted their supremacy; the latter show much greater relationship between the component elements. The last two groups are the Lattuka, east of the White Nile, who show marked differences from the neighbouring tribes, and have either migrated from the east, or are the remains of a former population; and the Bátua or dwarfs.

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* Keane (*Jour. Anth. Inst.*, 1885, p. 93) classed the Mittu with the black, long-headed type, while grouping the Bongo with the Zande, etc. (reddish, short-headed type).

Among the reports of papers read before the Vienna Society for the Promotion of Scientific Knowledge, is that of one by Dr. Lenz, in March, 1894, in which the well-known African traveller gives a *résumé* of our knowledge of the so-called dwarf races of Africa, partly suggested by Dr. Stuhlmann's investigations, and the two individuals brought by him to Europe. In discussing the notices to be found in early writers, he draws a sharp distinction between the fabulous account of the pygmies in Homer, with passages of later writers evidently based on it, and the much more credible notices in Herodotus and the ***Myriobiblon*** of Photios, which agree in speaking, not of pygmies, but of tribes "under the middle stature." The doubt so often thrown on the existence of races of small men, was due to the unnecessary assumption for them of very minute stature, and their association with fabulous accounts of giants. During the last two centuries (but especially within the last few decades) trustworthy observations of tribes answering to the description of Herodotus have gradually accumulated, showing, in spite of variety of name, a remarkable ethnographical and anthropological unity. A consideration of the probable distribution of the other three main types of the African population, previous to the immigration of the Hamites, leaves, unpeopled by them, the vast forest region between 10° N. and 10° S. lat., which we may justly consider as having then been occupied exclusively by tribes, of which the Akka, Watua, etc., of the present day are the scattered remnants. It is to be hoped that the scanty anthropological knowledge we yet possess about these will be largely increased under the *régime* of secure means of communication in Africa.

The extremely interesting, but difficult subject of the migrations of African tribes is dealt with, so far as concerns the southern half of the continent, by Dr. K. Barthel, in the *Mitteilungen* of the Leipzig Geographical Society (1893). The uncertainty of the native traditions is such that, although these must necessarily be consulted for the purpose, it is, with few exceptions, only the accounts of travellers within the last century which form a reliable basis on which to build conclusions. The writer deals successively with the migrations of the Bushmen, Hottentots, and Bantu. Among the first he includes all the races of small stature met with in Central and South Africa, and his conclusions in this respect coincide with those of Dr. Lenz. The migrations of this tribe have been involuntary, consisting of flight before stronger races into the most inaccessible parts of the continent. Those of the Hottentots have of late years—their former history is involved in uncertainty—partaken of the same nature, being on the whole in a northerly direction, and due to the pressure of the white colonists from the south. Those of the Bantu, of course, form the largest part of the subject, and are considered under three heads—(1) those south of the Zambesi; (2) those of Central and West Africa, between that river and the Equator; and (3) those in East Africa.

In the first region the Zulu migrations are the most important. This tribe, as well as the closely allied Caffres, seems originally to have come from the north-east, *i.e.* from equatorial East Africa, as is indicated by the fact that both tribes are cattle-rearers. Of historical migrations, that of the Matebele is most noteworthy, while others, of which only the tradition remains, account for the scattered tribes of Zulu origin in East Africa. Another important historical migration to the north in this region is that of the Makololo, who had their original home in Basuto Land. In the second region we have to depend chiefly on tradition, and the movements of tribes are not so clearly defined as elsewhere. A reason for the comparative stability of Central African states may be found in the fact that the people are all agriculturalists. A movement may often be traced from a central state outwards, as has been the case in Lunda. Here, too, restless trading tribes, like the Bangala and Kioko, have shifted their homes, while in the Central Congo basin, tribes like the Bakuba, Baregga, etc., appear to have come from the north-east. A movement from the centre towards the west coast, as, *e.g.*, that of the Fan, has not been uncommon. In the same direction was that of the Jagga, mentioned by the early writers on Angola, by which the old kingdom of Congo was shattered. In East Africa a shifting of population has been caused by the inroads of the Masitu (Zulus) from the south, and of the Masai, etc., from the north. The movements of the latter fall without the sphere of the article. That this eastern region was the starting-point of the Bantu migration is made probable by the fact that the characteristic occupations of the southern and central branches, cattle-rearing and agriculture, are here found united.

Copious references to authorities are given throughout Dr. Barthel's paper, and further study of the subject is thereby much facilitated.

THE MONTHLY RECORD.

THE SOCIETY.

The New Session.—The first meeting of the New Session will take place on Monday, November 11, when, after a brief introductory address by the President, Mr. A. Montefiore will give an account of the progress of the Jackson-Harmsworth Arctic expedition. The *Windward* has brought home full reports of the proceedings of the expedition up to date. These Mr. Harmsworth has kindly permitted Mr. Montefiore to make use of in preparing the paper for the Society. As will be seen from the programme inserted in the present number of the *Journal*, the second meeting will be occupied by Dr. K. Grossmann, who will give an account of his recent visit to the Faeroe Islands, of the geology and physical geography of which he has made a special study. At the third meeting the Rev. W. Weston will describe his explorations in the Central Alps of Japan. As will be seen from the programme, several other papers are expected; it is hoped that before the end of Session Mr. and Mrs. Littledale will have returned from their adventurous journey across Central Asia. Among the other arrangements for the Session are several interesting subjects for discussion at the special afternoon meetings in the map-room.

EUROPE.

Physical Geography of the Tay Basin.—The Perthshire Society of Natural Science possesses in its newly opened museum at Perth one of the finest and best-arranged collections of local geology, fauna and flora, to be found in any part of the United Kingdom. The Society has just published, as an extract from vol. ii. of its *Transactions*, a series of papers on the "Natural History of the Banks of the Tay," which is in effect a study of the physical geography of the area drained by the river, not yet complete, but presenting an excellent instance of local scientific work. The papers now published include—(1) Physiography, by Dr. H. R. Mill and Mr. James Coates, treating of the topography, the agricultural divisions and rainfall of the basin, and the volume, velocity, salinity, and temperature of the river and estuary; (2) Geology, the strategraphical and physical parts by Mr. Henry Coates, the superficial deposits by Rev. F. Smith; (3) Botany, by the late Dr. F. Buchanan White, who lays great stress on the part played by the river in the distribution of vegetation by carrying seeds, and also on the power of vegetation in altering the land by formation of marshes or islands in shallow water. Section 4 treats of Zoology—the Mollusca, by Mr. Henry Coates; Birds, by Colonel Drummond Hay; Mammalia, by Dr. Buchanan White. The concluding part treats of the Chemistry of the Tay Water, and is written by Dr. Andrew Thomson. Such an example as is here set might most advantageously be followed by other local scientific societies, which could take up the full study of a definite physical region of small extent, and so prepare the way for the compilation of a comprehensive geography of the British Isles such as has never yet been attempted.

Austrian Shipping on the Danube.—The Austrian shipping on the Danube is in the hands of the Imperial and Royal Danube Steamship Company. According to the latest returns, the length of the routes traversed in the year amounts to 2417 statute miles for passenger traffic and 3262 for the transport of goods. In 1893 the number of persons conveyed reached 3,151,414 and the goods carried amounted to 2,144,000 tons, 51·4 per cent. consisting of merchandise, 42·2 of corn, and 6·4 of coal. The traffic receipts amounted to £2,220,000 in 1893. The flotilla of the company consists (summer of 1895) of the following:—

Passenger steamers	58 paddle-steamers 3 screw-steamers	of 5138 nominal, 21,510 indicated horse-power.
Freight-steamers, canal-boats, etc.	94 paddle-steamers 20 screw-steamers 8 chain-ships	of 11,021 nominal, 41,480 indicated horse-power.
	787 barges with a capacity of 288,567 tons.	

ASIA.

Re-determination of Longitude between Greenwich and Madras.—The operations now in progress for determining the difference of longitude between Greenwich and India by telegraph by way of Teheran are of considerable importance, as all Indian map-work will in future be based thereon. The present longitude of Madras (to which those of all Indian stations are referred) is derived from Sir George Everest's lunar observations, which were taken about 1830. This determination is known to be over 2 miles wrong. All the Indian maps are projected with reference to this value, and to most of them a footnote is appended stating that the longitude is about 2′ 30″ in error. The difference of longitude between Bombay and Suez was determined by the Great Trigonometrical Survey of India in 1877, that between Suez and Greenwich having been previously determined by the British Transit of Venus expedition in 1874. This line, however, being unchecked, could not be relied upon with the confidence and certainty that ought to attach to the determination of fundamental longitudes; while, moreover, observations amply sufficing for transit of Venus purposes could not be said to be executed with the refinements and precautions requisite for purely geodetic purposes. It did not matter much, practically, what the longitude of the originating Indian station was so long as India was, so to speak, isolated, and her mapping remained unconnected with the European surveys. In fact, Madras might have been assumed to be a new zero, for the error was not large enough to affect navigation. But ever since our trans-frontier surveys have been extended into Afghanistan, Baluchistan, and Persia, inconvenience has been experienced by the officers charged with these operations, and a re-determination of the originating longitude became necessary. New telescopes and chronographs were obtained in October last year, and in November Captains S. G. Burrard and G. P. Lenox-Conyngham, R.E., started work. Karachi had already been joined with Madras, so, after obtaining sanction from the Secretary of State for India and the governments concerned, the arcs Karachi—Jask and Jask—Bushire were measured, the first by land line, and the latter by cable. Owing to the difficulties ever present in longitude operations, it was deemed advisable to check these by measuring the whole arc, Karachi—Bushire, Captain Burrard being the Jask observer, and Captain Lenox-Conyngham at Bushire. A circuit has thus been established between Karachi and Bushire, regarding which the observers feel perfect confidence. On each arc 300 stars were observed, 30 determinations of collimation and level, and 24 to 28 clock comparisons. With the aid of the astronomer royal, a convenient site for observation was founded on the true meridian of Greenwich, and the co-operation of Mr. Preece, engineer-in-chief to the General Post Office, having been secured, as well as that of the German government, the arc between Greenwich and Potsdam was satisfactorily measured in August last. As the Greenwich—Berlin and Berlin—Potsdam difference had been previously observed, a check-circuit has been obtained here. Captain Burrard is now at Potsdam, and Captain Lenox-Conyngham at Teheran, and they are at present engaged on the measurement of the arc between these two stations, which they anticipate completing in November. The former officer will then proceed to Bushire, when the Bushire-Teheran arc will be taken in hand, and the entire connection thus completed. By this plan of operations a verificating circuit has been secured at each end, and two single arcs in the centre, from which personal errors have been eliminated. The original design was drawn up in India, and included certain intermediate stations (Lowestoft, Emden, and Odessa), which, on the advice of Mr. Preece and Mr. Christie, were subsequently cut out, with the effect of simplifying the programme.

Mr. Rickmers in Trans-Caucasia.—Letters have been received from Mr. Willy Rickmer Rickmers, who, with Mr. H. Ingall and another companion, started in the beginning of last summer for an exploring trip in the Caucasus. Writing from Tiflis on September 25, Mr. Rickmers stated that he and his friends made their head-quarters in the Karch-Chal in July, and remained for two months and a half studying that mountain group. The numerous observations for altitude had not yet been worked up, but seven summits had been climbed, one at least of 12,000 feet. A plane-table survey was made, many photographs taken, and botanical and geological specimens collected. Mr. Ingall has recorded meteorological observations for two months without a break. The party intended doing further work in the Caucasus before the close of the year.

Danish Expedition to Central Asia.—A young Danish infantry officer, Lieut. Olufsen, intends in the beginning of next year to start to Samarkand, and here complete the preparations for an expedition to the Southern Pamir and Kafiristan. He will be accompanied by a young fellow-officer in the cavalry, Lieut. Philipsen; both are good sportsmen, and the leader has for several years studied topography and the Turkish language. A botanist may also accompany the expedition. The means at their disposal are moderate, and the object is stated to be exclusively scientific. The small expedition intends to start from Samarkand in May. It will follow the Serafshan river by the towns of Panja and Sabak, through the Pakshif Pass in the Serafshan mountains, crossing the Wadsh, a tributary of the Amu-Darya. Following the Panj, another tributary of the Amu-Darya, the expedition intends going to the town of Ishkasim, and thence *viâ* Sebak to Kafiristan, passing the Hindu Kush. The expedition hopes to be able to do some good topographical work, and obtain some useful results in ethnography, botany, zoology, etc., in those remote quarters of the world.

Salt Deposits in Persia and their Relation to the Sea.—The detailed examination by Dr. K. Natterer of the samples of water, salt, and soil brought by Dr. Stapf in 1885 from the steppe region east of Ispahan, has led him to some interesting comparisons between these inland salt deposits and the marine deposits from the Sea of Marmora and Eastern Mediterranean, examined by him at the same time. He has lately laid the results before the Imperial Academy of Sciences at Vienna. The most striking consists in the contrast brought out between the uniformity of chemical composition of the marine salts and the varied nature of that of the continental salt. This variety, according to Dr. Natterer, might, without apparent objection, be regarded as a result of such continued or periodic transport of small quantities of salt, which would be caused by a slow capillary mounting of the sea-water, and even that of inland lakes, in the soil of the deserts, as in a sponge. Although it is bold to assume such a movement of water extending over many miles, its very extent, he holds, would increase its importance for the promotion of gradual change of composition or position in the material of the continental masses. Salt derived by evaporation *in situ* from sea-water has a definite composition, lacking the variety of continental salt deposits such as those of Persia, while that brought from the surface of the sea by the agency of wind and rain is small in quantity, and differs little from ordinary sea-salt. Whereas if the deposits were due to the cause which Dr. Natterer suggests, the variety would be explained by the different rates of diffusion of the separate salts, and the different degrees in which they would be held back in masses of rock, sand, or clay. In the same way salts of the most varied composition might be formed in the neighbourhood of inland waters. By this hypothesis Dr. Natterer even suggests a solution of the problem of the peculiar composition of the salt dissolved in the water of the Dead

Sea. A capillary percolation of Mediterranean water within the under-water slope of the coast of Palestine and Syria (on which the sea-water is especially rich in organic substances) might supply the physical conditions requisite for the mutual working of chemical processes, whence the peculiarity of the Dead Sea salt would immediately result. Even the impregnation of the surrounding deserts with sodium chloride would find its explanation in the local conditions, if once Dr. Natterer's hypothesis should become established. It is only right, however, to add that the hypothesis is of a very improbable character, and that the difference in the saline constituents of the sea and salt lakes is usually explained in a simpler manner, which has the advantage of being readily tested by observation.

The Tea Trade of Tibet.—Mr. A. de Rosthorn has published a short pamphlet on the tea cultivation in Western Szu-chuan and the tea-trade with Tibet *viâ* Tachienlu. From his experience Mr. de Rosthorn is inclined to state pretty positively that wild tea does not grow in Western Szu-chuan, while for the cultivation of the domestic tea-shrub, the people are dependent on the natives of the districts of Mingshan and Zangan, who have a monopoly of the art of raising tea from seed and laying out plantations. This tea is of relatively poor quality, its only export-market is in Tibet, and Yunnan tea is imported for the use of the well-to-do. The earliest record of the Tibet trade is in 1074 A.D., when the Tibetans bartered horses for tea in Shan-hsi. The trade was under government control from the first, the system of *permits* now in vogue was introduced in 1127. Tachienlu was made the tea market in 1696, and in 1719 market privileges were extended to Lit'ang and Pat'ang also. The tea administration is now a highly organized and somewhat complicated branch of government service. The permits are issued by the Board of Revenue in Pekin each season, and must be returned there by the end of the year, with the revenue arising from the amount of trade represented by them. Tachienlu is allotted 108,000 such permits; but the local officials are empowered to issue 10,800 additional permits after the regular ones are exhausted, and at a lower rate, the proceeds being their perquisite. Each permit covers five packages of tea, and no tea is admitted into Tachienlu without its permit, which is stamped on entering, and given up and the duty paid when the tea is sold. There is keen competition amongst merchants for the permits, which are distributed by the sub-prefect of Tachienlu through the district magistrates. Poor though the tea grown in Western Szu-chuan is, the first and second qualities are too good for Tibetan trade. The third quality alone is used, and only 35 per cent. of that is considered necessary to mix with 65 per cent. of twigs and branches of scrub-oak and other brushwood. The mixture is chopped fine, steamed in tubs, partially dried, mixed with enough rice-water to make it adhesive, and packed tightly in cylinders of bamboo matting, the whole weighing sixteen or eighteen catties. These packages can in no sense be termed bricks. The value of this mixture, after packing, is about two-thirds of a penny per pound, and the profits on its sale amount to 75 per cent. In transport by porters, eleven or twelve packages, weighing from 250 to 280 lbs., are carried as a load. When sold, the tea is sometimes re-packed, the cylinders being cut in half and sewn up separately in hide casings. Mr. de Rosthorn shows that the cheapness of this tea makes it nearly impossible for Indian tea to compete with it. The Chinese appear to be fully aware that if the monopoly of the tea-trade were to be done away with, Chinese political influence would lose hold in Tibet, and they are careful always to keep the permitted supply below the actual demand, and to concede to the Tibetans, as a privilege which may at any time be withheld, the right to purchase tea in the Tachienlu market.

Tea Culture in Assam for 1894.—The number of tea-gardens on the register on December 31, 1894, was 823, against 794 on the same day in 1893, and the number of gardens which furnished statistics for the compilation of the report was 698, leaving 125 for which estimates had to be framed against 131 in 1893. A table is given showing the area under mature and immature plants and the total area held under tea-grants for each year since 1881, and from this it appears that the area under mature plants has increased each year in the period, from 133,293 acres in 1881 to 229,316 acres in 1894. The area under immature plants has increased from 25,134 to 39,480 acres, and the whole area under tea-grants from 706,649 to 1,059,237 acres between the same dates. The estimated yield of tea for 1894 was 94,829,059 lbs., or 414 lbs. per acre, against 94,219,904 lbs., or 426 lbs. per acre in 1893. The rainfall is given for eight stations. It varied in 1894 from 70·40 inches at Nowgong to 177·65 inches at Sylhet. The report is accompanied by an outline map on the scale of 1 : 3,041,280.

AFRICA.

The Korayo Valley, Somaliland.—Major H. S. Mainwaring, who made an expedition in Somaliland in 1894 in company with Mr. B. B. Christie and Lieutenant R. Sparrow, has sent us a map of the routes surveyed by him, together with some notes on the Korayo valley, the farthest point reached by the expedition. The routes led, to a considerable extent (as far as 42° E. long.), through the part of the country traversed by Dr. Donaldson Smith during the same year, but certain discrepancies are noticeable between the maps of the two travellers. The three streams supposed by Dr. Smith to unite with the Tug Turfa by a single channel north of 7° N. lat. (cf. *Journal*, 1894, p. 529; 1895, p. 135), are shown by Major Mainwaring as continuing southwards with independent courses southwards of that parallel. The Korayo valley, placed by Major Mainwaring north-west of the Tug Turfa or Turfo, would seem to be that of the Erer, visited lower down by Dr. Smith, and the physical features of the neighbourhood agree fairly well in the two accounts. The mountains, 3000 to 5000 feet high, marked on the American traveller's map, bear the name Mouldatta on Major Mainwaring's, and are said to be visible about 30 miles. The valley itself is described by the latter as quite the Eden of Somaliland, being thickly wooded, and the tops of the smaller hills covered with fresh green grass. At the bottom of the valley were found a running stream, luxuriant tropical vegetation, brilliant-plumaged birds, and bright flowers. It is unfortunately infested by a fly, apparently a species of tse-tsi, which proved fatal to the animals. Ten years ago the valley was thickly populated by a rich and warlike tribe (the Hawardens), but the great cattle epidemic raged here as in the rest of East Africa and the tribe broke up and dispersed, leaving the neighbourhood completely deserted, only about thirty individuals being found living in a cave. The natives declared that no white man had previously visited the valley.

Zanzibar, Zaila, and British Central Africa.—The annual Consular Reports for the year 1894, on these three British protectorates, have been lately issued. In all three a satisfactory increase of trade is to be observed. For Zanzibar the returns drawn up by Mr. Strickland, collector of customs, supply, as in former years, a detailed summary of imports and exports, in tables showing both the total amount of each article and the proportion of trade belonging to the various countries which have dealings with the port. A satisfactory point is that the increase both of imports and exports is an all-round one, distributed among the different countries represented. As regards imports, British India as usual heads the list, a large increase in that of grain being due to the failure of local crops; while of European countries Great Britain comes first, Hamburg next, and France third. The increase from "Ibea" is but small, but that from the Benadir coast (under an Italian company) is striking. The rise in exports to foreign countries is due chiefly to cloves, of which the crop for 1893–94 was a very good one. Great Britain took the largest part of the produce generally, British India coming next, and France (whither most of the copra exported goes) third. The returns of the port officer show a slight increase in the total ocean-going tonnage, but a decrease in the coasting tonnage, perhaps owing to improved communications between Europe and the mainland ports. The trade of Zaila for the last nine months of 1894 show a very marked increase as compared with the two preceding complete years. This is due chiefly to heavy exports of coffee from Harrar, and to a large increase in the import of cotton goods. The causes of these fluctuations are uncertain, and it cannot be confidently predicted whether the improvement will be maintained or not. Mr. Sharpe's report on British Central Africa, which is merely supplementary to Mr. Johnston's late exhaustive report of his three years' administration, notes a marked increase, during 1894, both of the trade and revenue, the total volume of the former having risen from £72,781 to £85,000. The largest article of import is calico of various kinds, the bulk of which now comes from the United Kingdom instead of from India and America. The export of coffee has risen from 93,188 lbs. in 1893 to 165,320 lbs. in 1894. The number of steamers on the Zambesi and Lower Shire (excluding gunboats) rose from six to nine during the year, while one new steamer (the twin s.s. Livingstone) was built on the Upper Shire. A steel sailing vessel has been placed on Lake Tanganyika. Labour for the Shire highlands is well supplied by the influx of workers from the Nyasa districts, but the great want is a light railway to facilitate the transport of coffee from Blantyre to the Shire. The port of Chinde at the mouth of the Zambesi is rapidly growing in importance. The botanical aspects of British Central Africa have also been dealt with in a separate report by Mr. Whyte (Miscellaneous Series, No. 373), who describes the steps taken by him for the formation of a botanical and experimental garden at Zomba, where he has raised many varieties of foreign vegetables, fruit, and ornamental trees, etc., the introduction of which seems desirable. Experiments with economic plants continue also to be made by Messrs. Buchanan. Besides coffee and tobacco, Mr. Whyte considers that tea might become a profitable cultivation, and expresses great faith in the prospects of cacao, which valuable product he has taken steps to introduce from Grenada, in the West Indies. He also recommends the cultivation of rubber-bearing plants (both of indigenous species and those found in other continents), the gutta-percha tree (from Penang), fibre plants (especially the bow-string hemps), and nutmegs. The report concludes with a consideration of the threatened locust plague, and the possibilities of coping with it by the screen and trap system, as well as of other pests likely to influence the agricultural prosperity of the country.

POLAR REGIONS.

The Jackson-Harmsworth Expedition.—The *Windward* has arrived in the Thames, and brought with her very full records of the expedition in Franz Josef Land under Mr. Jackson. During the autumn and spring several journeys had been made and depôts established to beyond 81° N. lat. Mr. Jackson reports considerable alterations on the map of Franz Josef Land as compared with the maps in Payer's narrative. A good many photographs have also been sent home. The members of the expedition were in perfect health when the ship left. A full account of the work accomplished up to date by Mr. Jackson will be given at the opening meeting of the Society this session.

Lieut. Peary's Expedition.—On his arrival at St. John's, Newfoundland, Lieut. Peary cabled to the New York *Sun* full details as to his last journey across

Greenland, from which we extract the following. After the return of the *Falcon* last year, the explorer, with his servant, Henson, and Mr. H. Lee, made their way back to Anniversary Lodge, Bowdoin Bay, having obtained on the way 500 lbs. of venison, birds, and hare. In spite of a cold and stormy September, a further supply of deer and walrus meat for the winter was obtained, and the next proceeding was to attempt to dig out the *caches* which had been made on the ice-cap. Already, however, this was covered with an extraordinary depth of snow, while during the search a new storm came on, lasting for six days, and burying the stores of provisions beyond hope of recovery. Almost all the biscuit and milk, all the compressed pea-soup, pemmican, and alcohol were thus entirely lost, and their place could only be supplied by reindeer and walrus meat, coal-oil, and ship's biscuit in open boxes. The winter was occupied mainly in preparations for the journey, varied by occasional sledge trips and deer-hunts. At the end of February Mr. Lee was laid up for over two weeks, and was by no means in good condition when the final start was made on April 1. Six Eskimo accompanied the party during the first day, and four (reduced to three by desertion) were to continue further to the site of the pemmican cache, 124 miles from the ice-edge. A renewed search resulted in the discovery of one cache only, from which the supplies of tinned biscuit and milk were replenished, but of the pemmican cache not a trace could be seen. The Eskimo having departed home, the advance was made with three sledges and forty-one dogs, difficulties with the latter, and a violent wind-storm, much impeding progress, and Mr. Lee suffering much from frost-bite. At the end of the second week 200 miles had been travelled and an altitude of 7000 feet reached. The temperature ranged from −10° to −25° at noon and −25° to −30° at midnight. At times the elevation was almost 8000 feet, and though a moderate pace could be kept up without difficulty, any extra exertion was followed by bleeding from the nose, and the strength of men and dogs was reduced by one-half. Mishaps to the sledges soon occurred, and the walrus meat being spent, the dogs became so weak as scarcely to be able to walk. They were therefore left with Mr. Lee, while Lieut. Peary and Henson started off for the land to the north in search of musk-oxen. They returned once unsuccessful, but determined to try again, this time meeting with a herd, of which ten were shot. The three travellers then pushed on to Independence Bay, reaching the precipitous shore after four days' incredible toil, travelling over steep slopes, boulder strewn-gorges, and sharp rocks bare of snow, the almost complete absence of which was most annoying. A further search for musk-oxen proving unavailing, it became necessary to begin the return journey, six days being taken up in again reaching the moraine over the bare rocks. For neither men nor dogs did more than seventeen days' rations remain, whilst by the use of snow-shoes, icing the sledge-runners, and every other expedient for facilitating progress, the distance to Anniversary Lodge could only be reached in twenty-five marches. The last of the provisions were consumed at the beginning of the last march of 21 miles. All were in a debilitated condition, but gradually recovered. The *Kite* arrived in Whale Sound (the entrance to Inglefield Gulf) on July 31, and Messrs. Diebitsch and Salisbury reached the Lodge overland from McCormick Bay on August 3, ice preventing the advance of the ship. After various hunting excursions in Smith Sound, Wolstenholme Sound, etc., the ship proceeded southwards, and brought away two of the meteorites from Melville Bay, the larger weighing three tons. While steaming across for Godhavn the *Kite* was held in the pack for two days, but Disco was reached on September 11 and St. John's on the 21st. A most valuable Arctic collection has been brought back. Lieut. Peary maintains that the further observations he has been able to make practically prove the insularity of Greenland.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Oceanic Depths.—We are indebted to the Indiarubber, Guttapercha, and Telegraph Works Company, Limited, of Silvertown, for the printed records "E" and "F," of soundings taken by their ships while laying cables in different parts of the world. The cables, concerning which particulars are given, are (in Paper "E") those in the Pacific along the west coast of Central and South America, including the 1890–91 expedition, with 350 soundings, on 17 of which temperature observations were made; and the 1893 duplicate cable expedition, with 126 soundings, on 24 of which temperature, and on 21 specific gravity observations were made. The 1890–91 soundings were all obtained between Valparaiso and Lima; while the 1893 expedition lay between Lima and Tehuantepec. The other pamphlet records work in the Atlantic. They include the Third West African Expedition, 1889, with 48 soundings, most of them with temperatures, between 20° N. and 15° S. along the west coast between the Canaries and Mossamedes. Ninety-six soundings are given on the Western and Brazilian Cables Expedition of 1891, from Cape Frio to Cape San Roque along the Brazilian coast, 155 soundings, many of them with serial temperature observations, taken in 1891 across the Atlantic from near Pernambuco to Cape Verde. From the South American Cable Company's expedition of 1892 there are recorded 138 soundings, with many temperature and specific gravity observations, from Cape Verde to off Bahia, and then northward in different parallel lines, investigating banks in deep water near the meridian of 32° W. Seventy soundings are given, showing work done during cable repairs in 1893, between 14° 51′ and 15° 36′ N. and 18° 17′ and 17° 36′ W. off Cape Verde, in which the depth varied from 785 to 1515 fathoms. Finally, details of 31 soundings made in laying the Ceuta-Gomera cable are given. The 'List of Oceanic Depths and Serial Temperature Observations Received at the Admiralty During the Year 1894,' records a good deal of work by H.M. surveying ships in deep water—including soundings by H.M.S. *Penguin* and H.M.S. *Dart*; in the South Pacific, by H.M.S. *Egeria*, in the Bay of Bengal, Arabian Sea, and Mediterranean; by H.M.S. *Waterwitch*, in the vicinity of the Hayward and Dacia Banks off the north-west coast of Africa; and by the Indian Marine Survey ship *Investigator* in the Arabian Sea. The serial temperatures obtained by the surveying ships are given in detail. These records would be rendered much more useful if they were accompanied by a short statement as to how far they correspond with or modify the provisional submarine contours which now appear upon many maps.

The Deepest Ocean Sounding.—Admiral Wharton announces in *Nature* of October 3, that Commander Balfour of H.M.S. *Penguin* has obtained the deepest authentic sounding yet recorded. In the South Pacific Ocean, latitude 23° 40′ S., longitude 175° 10′ W., about 60 miles north of a sounding of 4428 fathoms obtained by Captain Aldrich in 1888, it was found that 4900 fathoms of wire ran out, but before the weight reached the bottom, the wire broke. The new depth, even taking it as 4900 fathoms (29,400 feet; 8960 metres, or 5½ miles), is 245 fathoms greater than the deepest sounding ever previously found, in the Tuscarora Deep. It is now clear that the greatest oceanic depression extends farther below sea-level than the highest mountain ascends above it.

Lakes and Climate.—Dr. Willi Ule, whose work on the lakes of northern Germany is well known, published a short paper on the influence of lakes on climate in a recent number of the *Naturwissenschaftliche Wochenschrift*. He states the effects produced by lakes on the climate of the neighbouring districts as follows: The average annual temperature of lake-water being higher than that of the air, lakes exert on the whole a warming effect on the atmosphere. This is usually increased on account of the vertical distribution of water-temperature, but on the other hand diminished by the cooling effect of evaporation on the surface. Quite independent of the thermal reactions between water and air is the mirror-like action of the surface in reflecting the direct solar radiation into the surrounding air. The latter influence cannot be expressed statistically, and is probably only small. The supply of water-vapour yielded to the atmosphere is of value in moistening the neighbouring land, while the thermal changes over the water surface gives rise to currents of air which would not otherwise exist. There seems, however, to be a marked absence of proof as to the extent to which the various influences really work.

Recent Balloon Experiments in France.—In the *Comptes Rendus* of the Paris Academy of Sciences (vol. cxxi. p. 471) for September 30, MM. G. Hermite and Besançon describe, with the aid of a map and diagram, a remarkably interesting experiment in the management of ordinary balloons, of considerable importance in connection with Mr. Andree's proposed balloon expedition to the North Pole next year. At 11 p.m., on September 4, two balloons, the *Mage* and the *Archimedes*, were sent up. The *Mage*, keeping at the elevation of from 1000 to 3000 feet, was carried about 70 miles to the north-north-east of Paris, returning to the surface near Vauxresis, department Aisnes, at 5 a.m. The *Archimedes* at first kept within 350 feet of the ground, where a breeze was blowing exactly opposite to that prevailing in the higher layers of the atmosphere, and by 2.30 a.m. the balloon was over Chateaurenault in Indre-et-Loire, nearly 120 miles south-west of Paris. The aeronaut worked the balloon so far mainly by "guide-roping"; but, rising to over 1000 feet, too high for the use of the guide-rope, he got into the upper current and was carried back 60 miles to the north-east by 4.15, when sinking to about 500 feet, the lower current carried him again 70 miles to the south-west, until at 6.30 the rising sun expanding the gas in the balloon caused it to rise about 4000 feet, and it was carried back 60 miles to the north-east, descending at 8.25 a.m. close to Orgèces, which it had passed twice before on its zigzag journey. The *Mage*, keeping all the time in the upper current, had experienced some wonderful effects of moonlight on the mist which lay below, and before its final descent had remained in a dead calm for a quarter-of-an-hour at the height of about 300 feet.

GENERAL.

Geography in Mountaineering.—In Sir W. M. Conway's beautifully illustrated book, entitled 'The Alps from End to End,'* we find the record of an interesting journey along the whole line of the Alps from the Colle di Tendi in the west to the Sonnblick in the east. The object of this journey was partly to enforce on alpine-climbers the greater charm of a journey over a succession of peaks and passes, than a mere set of climbing exercises from a fixed centre; partly the object was to give two of the Gurkhas, who had already proved good mountaineers in the Karakoram expedition, an opportunity of seeing the methods of the best European guides. Both objects seem to have been fully attained. The book abounds in adventure and incident of the usual type, told with a cheery heartiness which strikes one pleasantly like a mountain breeze; but it has other qualities which entitle it to notice in these pages. The chapter on mountain-falls is a thrilling account of the great disaster at Elm, never, we believe, told in such detail in

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* 'The Alps from End to End.' By Sir William Martin Conway. With 100 full-page illustrations by A. D. M'Cormick. Westminster: A. Constable & Co., 1895.

English before; it brings home the intensity which the common land-changing agencies of every country assume in mountainous regions. So, too, the description of the Glacier de la Plaine Morte is interesting from the geographical point of view. It is a rocky basin without visible outlet, and filled with a great expanse of snow and ice. The rocky rim runs continuously round the margin, and the drainage escapes by underground channels through the limestone bed. Sir W. M. Conway points out very justly that a true conception of a mountain range can be better obtained by a journey such as he describes than by climbing from a centre. He says (p. 10), "A traveller who approaches a group of mountains by way of the valleys, and climbs each peak from some valley centre, naturally receives the impression that the valley level is the normal one, and that whatever is above that level is part of a peak. The climber, however, who takes a line across a series of peaks and ridges cannot avoid more justly regarding the whole mountain-mass as an elevated region, from whose mean level he descends into excavated hollows, or mounts to the summits of protuberances which are in fact the relatively insignificant ruins of a formerly yet more elevated mass." Another valuable result of a long mountain journey is the power it gives the mountaineer of distinguishing the characteristics of natural regions. P. 12: "He learns to think of the Maritime Alps as a ridge lying between sea and plain and commanding views of both. The Cottians he remembers for their wave-like sequence washing south; the Graians for the seeming irregularity of their arrangement and the loveliness of their valleys and hillside tarns. Mont Blanc enthrones itself once for all in his mind as monarch of the whole range. The limestone wall-peaks that fringe the northern range from the Buet to the Glärnisch and yet further east, come to be thought of as a single feature characteristic of the region as a whole, comparable in this sense to the long depression of the Rhone and Rhine valleys. All the great groups, Pennines, Oberland, and so forth, come to be known, not by the individual peaks they bear—mere trifling Matterhorns, Finsteraarhorns, and the like—but as huge masses of the folded earth-crust, compared with which peaks are details of small account." It is a little surprising to find that the use of maps is not known to alpine guides. One says (p. 271), "I have come to the conclusion that all young men who want to be guides should learn the use of map and compass before they are licensed. There would be many fewer accidents in bad weather if that were done. We are too old to learn, of course, but the young men might learn if the Alpine clubs would arrange for having them taught." A curious comment on this appreciation of maps is the fact that the book itself is without one.

Congratulatory Address to Dr. Heinrich Kiepert.—On July 31, the fiftieth anniversary of the day on which Dr. Kiepert received his doctorate, an address of congratulation was presented to him by the Royal Prussian Academy of Sciences. The address, which is published in part xxxviii. of the *Sitzungsberichte* of the Prussian Academy of Sciences, after referring to the influences under which he was trained for his work, and to the principal achievements of his past career, winds up with the following words: "But within the sphere which you command, that land which is the most important for the history of ancient civilization is that which above all lies in your hands. Your study is the headquarters for the scientific conquest of Asia Minor. You know every point at which our knowledge halts, every gap in the course of a stream not yet completely explored. From you the traveller receives every accurate direction; you alone know how to appreciate, and in the proper place to make use of, every small step in advance. If, accordingly, we may add a wish to our heartfelt congratulations, and to our thanks for what you have been to the Academy, it is that it may be permitted to you to lay before the friends of geography and history your Asia Minor with as much completeness and clearness as the state of our knowledge permits, and so also the whole *Orbis antiquus*, which we may regard as an academic work." A telegram of congratulation to Dr. Kiepert was sent on the same day from the President of the Sixth International Geographical Congress, in the name of all the geographers then assembled in London.

Italian Geographical Congress.—The second Italian Geographical Congress met at Rome during the latter part of September of the present year, being so arranged as to form part of the celebration of the twenty-fifth anniversary of the completion of Italian unity. The formal opening took place in presence of the King and Queen and other distinguished personages on September 22, the address being delivered by the Marquis Doria, President of the Italian Geographical Society. In the course of his speech he dwelt on the work of Italian explorers in North-east Africa, especially the lamented Prince Ruspoli, to whose father the gold medal of the Society was handed over as a memorial. For the business of the Congress four separate sections were formed, at the successive meetings of which numerous discussions were held and resolutions passed. In the first section, devoted to scientific geography, in addition to papers dealing with the physical geography of various parts of Italy, methods of survey, distribution of population, etc., resolutions were passed urging the importance of a systematic classification and nomenclature of lakes; of a determination of the areas of the separate subdivisions of the kingdom; of a more careful study of earth-movements in Italy; of a revision of the system of meteorological observations in the interests of barometric levelling; and of the study of the variations of Italian glaciers. The second section (economic and commercial) was occupied largely with the discussion of matters affecting the prospects of the Italian colony of Eritrea. The speakers on the whole took a favourable view of its resources, and recommended the encouragement of immigration by grants of land to agricultural labourers. The regulation by law of the pearl fisheries on the coast was also urged as a desideratum. The emigration question as affecting the relations of Italy with Brazil and other South American republics was discussed, and measures were recommended for the better protection of Italian emigrants. In the third (educational section) a discussion, initiated by Professor G. Marinelli, and continued by Professors Siragusa, Cora, and others, had for its subject a reform in the university system, with a view to improving the training of teachers for secondary schools. The introduction of a separate diploma in geography was recommended. A lengthened discussion also took place on the question of the subdivision of the mountains of the Italian Peninsula for didactic purposes; the propositions of Professor Porena being debated one by one, and a resolution finally carried, embodying the general sense of the meeting on the subject. In the last or historical section, the subjects dealt with included a proposed "Geographical Glossary of Italy in the Middle Ages;" suggestions as to the plan of a "History of Italian Cartography," and a proposal for a study of enclaves of foreign speech in Italy. Subjects of general interest were brought before general meetings of the Congress. The above account is taken from a report in *La Geografia per tutti* (September 30, 1895).

Scheme for the Investigation of Native Customs.—With a view to promoting the knowledge of the judicial, social, and other observances of aboriginal or partly civilized tribes, with especial reference to the Bantu race, the Berlin *Gesellschaft für vergleichende Rechts und Staatswissenschaft*, has, in the first number of its *Mitteilungen*, issued a scheme of inquiry, prepared by Dr. Max Beneke, for the guidance of those able to contribute information on the subject. This scheme, which is in the form of questions on the various points on which information is desirable, is to be reprinted and issued gratis to all who may be willing to contribute to the objects in view, and the co-operation of governments, societies (scientific or missionary), and other bodies, has been asked in order to bring the matter before the individuals most competent to supply useful information. The inquiry is divided into various heads, dealing respectively with the observances in use with respect to public or private life, property, mutual obligations between members of the tribe, law of inheritance, judicial proceedings, and penalties for various transgressions, and is partly based on the material collected by Dr. Friedrichs of Kiel, and on a similar scheme of questions published in the *Bulletin de la Société des Etudes Coloniales*, by Drs. Cattier and Wodon.

A Slavonic Geographical Review.—We have received the first two numbers of *Sbornik*, the journal of the Chech Society of Geography at Prague, printed in the Chech language. As a society founded for the special study of a locality by the people residing in it, we welcome the new organization; but it is unfortunate that the geographers of Western Europe should be debarred from participation in the work that is recorded in the review. It is doubtful, indeed, whether the publication of original memoirs in local languages of small range, and offering no inducements for outsiders to acquire them, is in reality a way to advance science. For the locality, it no doubt is capable of doing valuable work, but it presents serious difficulties to foreign bibliographers in translating the titles, and to foreign printers in endeavouring to set up the original titles.

OBITUARY.

Bishop Chauncy Maples.

By the Rev. Horace Waller.

A brief telegram from Commissioner Johnston announces the death by drowning of Bishop Chauncy Maples, on Lake Nyasa, through the capsizing of a boat whilst the newly consecrated bishop was on the last stage of his return journey from England to the island of Likoma. The date given is September 12.

No man has been more identified with modern African missionary enterprise. Educated at Charterhouse and University College, Oxford, he joined Bishop Steere's staff at Zanzibar as a member of the Central African Mission in 1876. After a short stay on the mainland, he repaired to the Rovuma district; his principal work, however, will always be associated with Likoma, and the lake-dwellers' villages on the eastern shore of Nyasa.

Of a singularly happy and active disposition, a fluent linguist, and a man of many attainments, he, in company with his college friend, the Rev. W. P. Johnson, accomplished the heavy task of reducing the very difficult Yao language sufficiently to employ a company of native printers perpetually at work on translations in this and the Nyasa tongue for the use of the adjacent tribes. *The Nyasa News*, a periodical of Bishop Maples' creation, has served an especially useful purpose. It supplies us with good geography, ethnological and zoological treatises, together with Central African problems—as they occur to men on the spot—of the highest interest. By raising missionary literature out of the rut in which it is too apt to drag on at weary length, he did good service, and his loss must be keenly felt by those who know how entertaining African enterprise is, but how seldom the appreciative and sensible observer can be found to record it. For hard on twenty years Bishop Maples threw himself into the work of undermining the brutalities of tribes steeped in slave-trading, and in the darkest spots of savagedom. At times his life was in the greatest danger, and never more so than when, in a Magwangwara raid, the Mission station near the Rovuma was sacked and burned. In spite of all obstacles, the lake-shore villages have numerous groups of converts; and churches, schools, and teachers are located over a considerable area. The sphere of these operations was assigned to Portugal when the division of territory took place, together with all the appliances for these civilizing processes. Bishop Maples seemed in his own person to prove what exceptions there are to the rule, for whilst to some a residence on Likoma island meant death in a few weeks, or the necessity for immediate removal, he himself had seldom to yield to the severe fevers of the lake.

That the Society has lost a clever contributor to its African knowledge will be only too plain when the articles and speeches are turned to which Bishop Maples contributed from time to time in our journals and at our meetings, and the members of the Royal Geographical Society will share in the profound regret which has been spread far and wide by the receipt of the above sad news. Bishop Maples was a life Fellow of the Society, having joined in 1884.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. R. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Alps. **Conway.**

The Alps from end to end. By Sir William Martin Conway. With 100 full-page illustrations by A. D. M'Cormick. Westminster: A. Constable & Co., 1895. Size 10 × 7, pp. xii. and 404. *Price* 21*s*. *Presented by the Publishers.*

The plan of the journey recorded in this splendid volume is noted in the Monthly Record.

Alps. *Le Globe* (*Mémoires*) 34 (1895): 1-21. **Ritter.**

Études sur l'orographie et l'hydrographie des Alpes de la Savoie. Par M. Étienne Ritter.

England—Cumberland and Westmorland. **Brockbank.**

Mem. and P. Manchester Lit. and Philos. S. (4) 9 (1894-95): 195-205.

Notes on Glacier Moraines in Cumberland and Westmorland. By W. Brockbank. *With Plates.*

This appears to be the republication of a paper written twenty-five years ago, and then only printed in abstract. It contains reproductions of excellent drawings of moraines in the Lake district, and suggestions as to the origin of the tarns by moraine-dams.

England—Glacial Deposits of the South-East. **Brown.**
Notes on the high-level river drift between Hanwell and Iver. By J. Allen Brown. Reprinted from the *Proceedings* of the Geologists' Association, vol. xiv., pp. 153-173 (August, 1895). Size 8½ × 6. *Sections. Presented by the Author.*

European Continent. **Lindley.**
The Great Eastern Railway Company's Tourist-Guide to the Continent. Edited by Percy Lindley. London, 1895. Size 7½ × 5, pp. 158. *Maps, Plans, and Illustrations. Price 6d. Presented by the Publishers.*

France—Alpes-Maritimes. *C.R.* **121** (1895): 137-141. **Bertrand.**
Sur la tectonique de la partie nord-ouest du département des Alpes-Maritimes. Note de M. Léon Bertrand.

France—Barrois. *Rev. G.* **37** (1895): 33-41, 85-99. **Despiques.**
Le Pays Barrois dans l'œuvre d'André Theuriet. Essai de géographie pittoresque. Par Paul Despiques.

This essay is interesting as an attempt to reflect from romance upon geographical instruction the vivid light thrown on romance by the study of the forms and products of the land. M. Theuriet seems to have himself possessed in no small measure the geographical instinct to which he drew attention in Balzac, and which appears so brilliantly in the writings of William Wordsworth and of Robert Louis Stevenson.

France—Haute Savoie. *Le Globe* (*Mémoires*) **34** (1895): 67-108. **Chaix.**
Contribution à l'Étude des Lapiés. La topographie du désert de Platé. Par Émile Chaix. *With Map and Plates.*

France—Migrations. **Turquan.**
Les courants de migration intérieure en France. Par M. V. Turquan.—Congrès National des Sociétés Françaises de Géographie. XV^e Session. Lyon, 1894. Compte rendu des travaux du Congrès. Lyon: E. Vitte, 1895. Size 10 × 6½, pp. 305-356.

France—Rhone Valley. *Ann. G.* **4** (1895): 432-452. **Depéret.**
Aperçu sur la structure générale et l'histoire de la formation de la vallée du Rhône. Par M. Ch. Depéret. *With Maps.*

Germany. **Hahn.**
Topographischer Führer durch das Nordwestliche Deutschland. Ein Wanderbuch für Freunde der Heimats- und der Landeskunde. Von Dr. F. G. Hahn. Leipzig: Veit & Co., 1895. Size 7 × 5, pp. xii. and 322. *Maps. Presented by the Author.*

This is a guide-book of a new type, designed for the use of students of nature. It gives prominence to the physical features of the district, with references to the influence of these features on the geography of the land. The plan is to consider detailed routes, and the book is adapted for the pedestrian, who should also carry good maps, for those included are mere sketches showing nothing but the routes. Professor Hahn promises to produce similar guide-books for other regions.

Germany—Frankfort-on-the-Main. **Bleicher.**
Statistische Beschreibung der Stadt Frankfurt am Main und ihrer Bevölkerung. Im Auftrage des Magistrats herausgegeben durch das Statistische Amt. II. Theil. Die innere Gliederung der Bevölkerung. Bearbeitet von dem Vorsteher des Statistischen Amtes. Dr. H. Bleicher. Frankfurt a. M., 1895. Size 11 × 7½, pp. 288 and lxxxvi. *Maps.*

Greece—Magnetic Conditions. *M.K.K. Militär G.I.* **14**, 1894 (1895): 187-241. **Hartl.**
Meteorologische und magnetische Beobachtungen in Griechenland, ausgeführt von Heinrich Hartl.

Iceland. *Scottish G.M.* **11** (1895): 441-466. **Johnston-Lavis.**
Notes on the Geography, Geology, Agriculture, and Economics of Iceland. By H. J. Johnston-Lavis. *With Illustrations.*

Ireland. **Ward.**
Thorough Guide Series. Ireland (Part II.) East, West, and South, including Dublin and Howth. By C. S. Ward. Twenty-six Maps and

Plans by Bartholomew. Third Edition—Revised. London: Dulau & Co., 1895. Size 6½ × 4½, pp. xvi. and 232. *Price 5s. Presented by the Publishers.*

This edition has been enlarged by the inclusion of a good deal of new matter, which makes the guide-book more serviceable than ever.

Russia—Kildin Island. *C.R.* **120** (1895): 1376–1377. **Venukoff.**

L'île de Kildine et ses particularités hydrologiques. Note de M. Venukoff.

Russia—Kolgueff Island. **Trevor-Battye.**

Ice-bound on Kolguev. A chapter in the Exploration of Arctic Europe, to which is added a record of the Natural History of the Island. By Aubyn Trevor-Battye. With numerous illustrations by J. T. Nettleship, Charles Whymper, and the Author, and three Maps. Westminster: A. Constable and Co., 1895. Size 10 × 7, pp. xxviii. and 458. *Price 21s. Presented by the Publishers.*

Mr. Trevor-Battye presents an excellent account of his recent visit to Kolgueff, with good illustrations and useful scientific appendices, giving much new information derived from his observations on the island and the collections which he brought home.

Russia—Rainfall. *Globus* **68** (1895): 213–218. **Köppen.**

Die Regengebiete des Europäischen Russlands nach der Verteilung der Tage mit Niederschlag über das Jahr. Von Dr. W. Köppen.

Scotland—Banks of the Tay. ———

The Natural History of the Banks of the Tay. Being a series of papers read before the Perthshire Society of Natural Science. [*Transactions*, Vol. II., Part II.] Perth: Published by the Society, 1895. Size 9 × 5½, pp. [64]. *Frontispiece. Price 2s. 6d. Presented by Henry Coates, Esq.*

This is noticed in the Monthly Record.

Scotland—Sutherland. *Scottish G.M.* **11** (1895): 385–393. **Cadell.**

The Scenery of Sutherland. By Henry M. Cadell. *With Maps and Illustrations.*

Spain. **Routier.**

Gaston Routier. Deux mois en Andalousie et à Madrid. Paris: H. Le Soudier, 1894. Size 10 × 6½, pp. 142. *Portraits. Presented by the Author.*

The record of a journalist who attended the Columbus fêtes in Spain. Portraits of the King and Queen-Regent of Spain, and of the King and Queen of Portugal, are reproduced.

United Kingdom—England. **Smith.**

Climbing in the British Isles. I.—England. By W. P. Haskett Smith. With twenty-three Illustrations by Ellis Carr, and five Plans. London: Longmans & Co., 1894. Size 6½ × 4½, pp. xii. and 162. *Price 3s. 6d. Presented by the Publishers.*

United Kingdom—Wales and Ireland. **Smith and Hart.**

Climbing in the British Isles. II.—Wales and Ireland. Wales. By W. P. Haskett Smith. Ireland. By H. C. Hart. With thirty-one Illustrations by Ellis Carr and others, and nine Plans. London: Longmans & Co., 1895. Size 6½ × 4½, pp. viii. and 198. *Price 3s. 6d. Presented by the Publishers.*

These little books are arranged in the form of an alphabetical Gazetteer, or rather Encyclopædia of Climbing. The entries refer to all important crags in the region treated of. They are written in the light vein characteristic of mountaineers, and the names of all the climbers who have been killed in their pursuit of this fascinating sport are mentioned in describing the scene of the accident. The illustrations are clear, and maps are not neglected.

ASIA.

Arabia. **Landberg.**

Arabica. Par le Comte de Landberg. No. III. Der Dialect von Hadramût. Les Métiers de Hadramût. D. H. Müller: Die Burgen und Schlösser Südarabiens. A. Seidel: Praktisches Handbuch der arabischen

Umgangssprache des ägyptischen Dialekts. Leyden: E. J. Brill, 1895. Size 9½ × 6, pp. 130. *Plates. Presented by the Author.*

The Count of Landberg announces his intention of continuing his periodical "Critica Arabica" under the title of "Arabica," and expresses his willingness to send the publication free on application to him at Schloss Tutzing, Upper Bavaria.

Arabia—Mecca. *B.S.G. Lyon* 13 (1895): 101–129. **Courtellemont.**

Un Voyage à la Mecque. Par M. Gervais Courtellemont.

M. Courtellemont, a young French artist in Algeria, having professed conversion to Mohammedanism, was allowed to make the pilgrimage to Mecca, and the incidents of the journey are here recounted by M. Gaston Laforest.

Armenia. *J. Tyneside G.S.* 3 (1895): 127–130. **Tcheraz.**

Armenia, the Country and the People. By Prof. Minas Tcheraz. *With Portrait.*

Asia. **Sievers.**

Asien. Eine allgemeine Landeskunde. Von Prof. Dr. Wilhelm Sievers. Leipzig and Vienna: Bibliographisches Institut, 1893. Size 10½ × 7½, pp. viii. and 644. *Maps and Illustrations (some coloured). Price* 15*s*.

Asia Minor—Anatolia. *Globus* 68 (1895): 57–64. **Kannenberg.**

Besuch in einem anatolischen Dorfe. Von Pr.-Lt. Kannenberg. *With Illustrations.*

Asia Minor, etc.—Murray's Handbook. **Wilson.**

Handbook for Travellers in Asia Minor, Transcaucasia, Persia, etc. Edited by Major-General Sir Charles Wilson, R.E., etc. *With Maps and Plans.* London: John Murray, 1895. Size 7 × 4½, pp. xii., [88], and 416. *Price* 18*s*. *Presented by the Publisher.*

This is practically a new book, and under the editorship of Sir Charles Wilson it includes the work of the first specialists on a variety of subjects, the history of Asia-Minor being treated by Prof. Ramsay and Mr. Hogarth, who also deal with many points of archæology; sport is dealt with by Col. Chermside and Major Bennet; the routes in the various parts of the extensive region considered are contributed by well-known authorities. There are several illustrations in the text, and the maps are numerous and of the latest date, that of Anatolia being specially compiled for the book.

Borneo—Mount Kinabalu. **Stapf.**

On the Flora of Mount Kinabalu in North Borneo. By O. Stapf, Ph. D. (Transactions of the Linnean Society, 2nd Ser. Botany, vol. iv, Part 2.) London, 1894. Size 12 × 9½, pp. [196]. *Plates. Presented by the Author.*

A notice of some of the more strictly geographical details of this magnificent piece of work will appear in the Monthly Record.

Central Asia. *G.Z.* 1 (1895): 257–285. **Obrutschew.**

Geographische Skizze von Centralasien und seiner südlichen Umrandung. Von W. Obrutschew. (Geographische Ergebnisse seiner Reise von 1892-94.) *With Map.*

China. **Rockhill.**

A Pilgrimage to the Great Buddhist Sanctuary of North China. By William Woodville Rockhill. Reprinted from *The Atlantic Monthly* for June, 1895. Size 9½ × 6½, pp. 14. *Presented by the Author.*

The account of a visit to Wu-t'ai shan in 1887, including some interesting descriptions of the Great Wall, Kalgan, and of the south of Mongolia.

China—W. Ssuch'uan—Tea. **Rosthorn.**

On the Tea Cultivation in Western Ssŭch'uan and the Tea Trade with Tibet *viâ* Tâchienlu. By A. de Rosthorn. *With Sketch Map.* London: Luzac & Co., 1895. Size 7½ × 5½, pp. 40. *Presented by the Author.*

This pamphlet will receive notice in the *Monthly Record*.

Chinese Empire. *Nineteenth Century* (1895): 236–260. **Hallett and Black.**

New British Markets: (1) Western China. By Holt S. Hallett. (2) Tibet. By C. E. D. Black.

Chinese Empire—Tibet. **Raverty.**

Tibbat three hundred and sixty-five years ago. By Major H. G. Raverty. From the *Journal*, Asiatic Society of Bengal, vol. lxiv., Part 1, No. 2, 1895. Size 9½ × 6½, pp. 42. *Presented by the Author.*

An account of the country which we fear would scarcely be recognized in Europe under its correct name of " Tibbat," as seen by "the Mughal Prince, the Mirza, Muhammad Haidar, the Gurgan, of the Doghl-at tribe of the Mughals," nearly 400 years ago. The system of spelling the various names is so complicated by the use of diacritical marks, joined letters, and combinations impossible in English pronunciation, that no ordinary reader could understand them. In a MS. note on the copy presented, Major Raverty protests against his editors having changed *ch* into *c*, *k* into *q*, and making other alterations in his spelling.

Chinese Studies. **Cordier.**

Les études Chinoises (1891–1894). Par Henri Cordier. "Extrait du T'oung-pao," Vol. V., No. 5, et Vol. VI., No. 1. Leide: E. J. Brill, 1895. Size 10½ × 7, pp. 90. *Presented by the Author.*

Chitrál. **Leitner.**

The Future of Chitrál and neighbouring countries. By G. W. Leitner. (Reprinted from the *Imperial and Asiatic Quarterly Review*, July, 1895.) Woking. Size 10 × 6½, pp. 20. *Maps and Portrait.*

Eastern Asia. **Cordier.**

L'Extrême-Orient dans l'Atlas Catalan de Charles V., Roi de France. Par M. Henri Cordier. (Extrait du Bulletin de géographie historique et descriptive, 1895.) Paris: Imp. Nationale, 1895. Size 11 × 9½, pp. 48. *Facsimiles.*

Formosa. **Garnot.**

L'Expédition Française de Formose 1884–1885. Par le Capitaine Garnot. With Atlas. Paris: Ch. Delagrave, 1894. Size 9 × 6; (Atlas), 12½ × 11, pp. 10 and 234. *Illustrations. Price* 10 *francs.*

A valuable contribution to our knowledge of this still largely unexplored island.

Formosa—Bibliography. **Cordier.**

Bibliographie des ouvrages relatifs à l'Ile Formose. Par Henri Cordier. Chartres: Imp. Durand, 1893. Size 12 × 9½, pp. 60. *Presented by the Author.*

This exhaustive bibliography forms part of the great work of Imbault-Huart entitled "L'Ile Formose," and gives a transcript and occasionally a facsimile of the titles of all known works dealing with the island to the close of 1892.

French Indo-China—Red River. **Escande.**

Rev. Maritime et Coloniale 126 (1895): 63-81.

Étude sur la navigabilité du fleuve Rouge. Par M. Léon Escande.

Lieut. Léon Escande, on the French gunboat *Moulun*, made two trips on the Red River, to test its navigability and survey the surrounding country, in March, April, and May, 1893, and from November, 1893, to June, 1894. The result was to prove that vessels drawing 3 feet 3 inches and steaming 8 to 10 knots can navigate the Red River as high as Lao-Kai all the year round; while during half the year vessels of twice the draught could ascend to the frontier of Tonkin if capable of steaming 10 to 12 knots. The arrival of French gunboats on the upper river has enabled the native junks to trade freely by suppressing the piratical tribes living on the banks.

India—Malabar. **Hirth.**

Das Reich Malabar nach Chao Ju-Kua. Von Friedrich Hirth. Separatabdruck aus T'oung-Pao, Vol. VI., No. 2. Leyden: E. J. Brill, 1895. Size 10 × 6½, pp. 16. *Presented by the Author.*

Japan. **Wilson-Carmichael.**

From Sunrise Land. Letters from Japan. By Amy Wilson-Carmichael. Preface by Rev. C. A. Fox. London: Marshall Bros., 1895. Size 8½ × 7½, pp. xii. and 180. *Illustrations. Price* 5*s*. *Presented by the Publishers.*

Missionary letters, of interest on account of the graceful Japanese drawings which are interspersed.

Japanese Alps. *Alpine J.* 17 (1895): 493–510. **Weston.**

Mountaineering and Mountain Superstitions in the Japanese Alps. By the Rev. Walter Weston. *With Illustrations.*

Malay Archipelago. *Tijd. K. Ned. Aardrijks. Genoots* (2) 12 (1895): 363–394. **Kan.**

Het maritiem onderzoek van den Oost-Indischen Archipel. Door Prof. Dr. C. M. Kan.

Malay Archipelago—Java. **Oudemans.**

Die Triangulation von Java ausgeführt vom Personal des geographischen Dienstes in Niederländisch Ost-Indien. Vierte Abtheilung. Das primäre Dreiecknetz. Im Auftrag des Ministeriums der Kolonien und unter Mitwirkung von J. C. A. Van Asperen, M. L. J. Van Asperen, W. G. Teunissen, bearbeitet von Dr. J. A. C. Oudemans. Hague: M. Nijhoff, 1895. Size 14 × 11, pp. iv. and 224. *Plates. Presented by the Editor.*

Malay Archipelago—Sumatra. **Meerwaldt.**

Tijds. Ind. Taal-Land-en Volkenk. 37 (1894): 513–550.

Aanteekeningen betreffende de Bataklanden, door J. H. Meerwaldt.

A general account of the Batak land and people, compiled from the chief authorities.

AFRICA.

Africa. **Sievers.**

Afrika. Eine allgemeine Landeskunde. Von Prof. Dr. Wilhelm Sievers. Leipzig und Wien: Bibliographisches Institut, 1891. Size 10½ × 7½, pp. viii. and 468. *Maps and Illustrations (some coloured). Price 12s.*

Africa and Europeans. *Nineteenth Century* (1895): 455-465. **White.**

Africanists in Council. By A. Silva White.

A criticism of the discussion on Europeans in Africa, held at the Sixth International Geographical Congress.

British East Africa—Uganda, &c. **Colvile.**

The Land of the Nile Springs; being chiefly an account of how we fought Kabarega. By Colonel Sir Henry Colville, K.C.M.G., etc. Illustrated by Mr. J. Burrell-Smith and Mr. Twidle, from sketches by the author and Major Thurston, and from photographs by the author. London: Edward Arnold, 1895. Size 9 × 6, pp. xiv. and 312. *Maps. Price 16s. Presented by the Publisher.*

After a thoroughly characteristic preface by way of good-humoured but quite unnecessary apology, Sir Henry Colville describes his journey from Mombasa to Uganda, gives an account in three very short chapters of Usoga, Uganda, and Kampala, and then enters at some length into the history of his adventurous campaign against Kabarega. The author protests against the usual spelling of some Swahili names, saying that Mkuyuni and Ndi, for example, are pronounced Emkuyuni and Endi, and should be so written. In the course of the operations the expedition made the circuit of Lake Albert, and also visited a number of points on the plateau between Lake Albert and the Victoria Nile.

British East Africa—Uganda. *Contemporary Rev.* (1895): 15–20. **Elliot.**

The best route to Uganda. By G. F. Scott Elliot.

Mr. Scott Elliot advocates the route from the Zambesi by way of the lakes, constructing railways between the stretches of waterway.

Congo Free State. **Delporte and Gillis.**

Mém. Couronnés and Mém. Savants Étrangers A. R. Belgique, 53 (1894): 1–114.

Observations Astronomiques and Magnétiques exécutées sur le territoire de l'État Indépendant du Congo. Par le Capitaine Adjoint d'État-Major A. Delporte et le Capitaine Adjoint d'État-Major L. Gillis. *With Plates.*

This will be specially noted.

East Africa—Jub River. **Bóttego.**

Vittorio Bóttego. Viaggi di scoperta nel cuore dell' Africa. Il Giuba Esplorato sotto gli auspici della Società Geografica Italiana. Rome: E. Loescher and Co., 1895. Size 10 × 7, pp. xiv. and 538. *Portrait, Maps, and Illustrations. Price 8s.*

A handsome and richly illustrated volume giving a full account of the journey of Bóttego and Grixoni for the exploration of the Jub river.

East Africa—Sesse Islands. *Petermanns M.* 41 (1895): 169. **Brard.**

Die Sesse-Inseln. Nach brieflichen Mitteilungen. Von P. Brard. *With Map.*

Egypt—Red Sea. **Buxton.**

On either side of the Red Sea. With illustrations of the Granite Ranges of the Eastern Desert of Egypt, and of Sinai. By H. M. B., C. E. B., and

T. B. With an Introduction and Footnotes by E. N. Buxton. London: E. Stanford, 1895. Size 8½ × 6½, pp. viii. and 164. *Illustrations. Presented by E. N. Buxton, Esq.*

The series of letters published here give an excellent idea of two interesting holiday trips—one up the Nile to Keneh and thence into the desert, the other in the Sinaitic peninsula. The illustrations are uniformly good, and many of them of unusual interest, showing typical views of desert scenery.

Eritrea. **Franchetti.**

Secondo Congresso Geografico Italiano. L'avvenire della colonia Eritrea. Conferenza tenuta dall' onorevole Barone Leopoldo Franchetti nell' Adunanza generale del 24 settembre, 1895. Roma: Presso la Società Geografica Italiana, 1895. Size, 10 × 6½, pp. 24. *Presented by the Author.*

Eritrea. *Globus* 68 (1895): 85–87. **Fritzsche.**

Die Bevölkerungsverhältnisse der italienischen Kolonie Erythræa. Von W. H. Fritzsche. Rom. *With Map.*

French Congo. *B.S.G. Paris* (7) 16 (1895): 211–218. **Berton.**

De Lastourville sur l'Ogôoué à Samba sur le N'Gounié (septembre et octobre, 1890). Par J. Berton. *With Map.*

German East Africa. **Peters.**

Das Deutsch-Ostafrikanische Schutzgebiet. Im amtlichen Auftrage von Dr. Karl Peters. Munich and Leipzig: R. Oldenbourg, 1895. Size 10 × 7, pp. x. and 468. *Maps and Illustrations.*

German East Africa. **Ramsay and Stuhlmann.**

M. Deutsch. Schutzgeb. 8 (1895): 141–145.

Astronomische Ortsbestimmungen des Herrn Kompagnieführers Ramsay auf der Reise von Kisaki nach Dar-es-Salâm im April und Mai des Jahres 1894. Berechnet von Dr. L. Ambronn.

Neue astronomische Bestimmungen des Herrn Dr. Stuhlmann in Ostafrika aus dem Jahre 1894. Berechnet von Dr. W. Brix.

Madagascar. *Rev. Scientifique* (4) 4 (1895): 107–112. ———

Le sol et le climat de Madagascar au point de vue de l'agriculture.

Madagascar. *Rev. Scientifique* (4) 4 (1895): 231–236. **Meunier.**

Le sol de Madagascar. Par M. Stanislas Meunier.

Madagascar—Place-Names. *B.S.G. Commerc. Paris*, 17 (1895): 589–598. **Grandidier.**

Des principaux noms de lieux de Madagascar et de leur signification. Par M. Alfred Grandidier.

Madagascar. **Piolet.**

Madagascar et les Hova. Description, Organization, Histoire. Par J. B. Piolet. Paris: C. Delagrave, 1895. Size 9 × 6, pp. 284. *Map. Price 5 fr.*

M. Piolet, a former missionary amongst the Hova, gives a careful account of the characteristics and history of that people, and then proceeds to state the case for French interference and to demonstrate the necessity for the absolute possession of the island by France.

Madagascar. **Routier.**

Gaston Routier. Les Droits de la France sur Madagascar. Paris: H. Le Soudier, 1895. Size 7½ × 5, pp. 272. *Presented by the Author.*

The title of this work sufficiently indicates its purpose and its contents.

NORTH AMERICA.

British North America—Labrador. *Scottish G. Mag.* 11 (1895): 335–361. **Bell.**

The Labrador Peninsula. By Robert Bell. *With Map and Illustrations.*

Canada—Alberta. *J. Geology* 3 (1895): 507–511. **Dawson.**

Notes on the Glacial Deposits of South-western Alberta. By George M. Dawson.

Mexico. **Routier.**

Gaston Routier. Le Mexique. Limites géographiques, Orographie, Hydrographie, l'Agriculture, la Flore, la Faune et les Mines, l'Industrie et le Commerce. Avec une Préface de Ignacio Altamirano. Paris: H. Le Soudier, 1891. Size 10 × 6½, pp. xviii. and 110. *Map. Presented by the Author.*

Mexico. **Routier.**

Gaston Routier. L'histoire du Mexique. Le Mexique de nos jours. Renseignements économiques and messages présidentiels. Paris: H. Le Soudier, 1895. Size 7½ × 5½, pp. l. and 196. *Portrait.*

A sketch of the history, constitution, and resources of Mexico.

United States. ———

Annual Report of the Chief of Engineers, United States Army, to the Secretary of War, for the year 1894. 6 Parts. Washington: 1894. Size 9½ × 6, pp. 3592. *Maps, Plans, &c. Presented by the Engineer Department, U.S. Army.*

United States—Alaska—Baird Glacier. *J. Geology* 3 (1895): 512–518. **Klotz.**

Experimental application of the Photo-Topographical method of surveying to the Baird Glacier, Alaska. By Otto J. Klotz.

United States—Alaska—Magnetic Declination. **Schott.**

Treasury Department, United States Coast and Geodetic Survey, W. W. Duffield, Superintendent. Bulletin No. 34. Distribution of the Magnetic Declination in Alaska and adjacent waters for the year 1895. With one chart. A report by C. A. Schott. Washington: Government Printing Office, 1895. Size 9 × 6, pp. [8].

United States—Alaska—Yukon River. *B. American G.S.* 27 (1895): 143–160. **Russell.**

A Journey up the Yukon River. By Israel C. Russell. *With Illustrations.*

United States—Chinuk Texts. **Boas.**

Smithsonian Institution, Bureau of Ethnology, J. W. Powell, Director. Chinook Texts. By Franz Boas. Washington: Government Printing Office, 1894. Size 10 × 6½, pp. 278. *Portraits. Presented by the Smithsonian Institution.*

United States—Maryland. **Silver.**

Johns Hopkins University Studies. Thirteenth Series. X. The Provisional Government of Maryland (1774–1777). By John Archer Silver. Baltimore: the Johns Hopkins Press, 1895. Size 9½ × 6½, pp. 62.

United States—Maryland, etc., James and Potomac Valleys. **Fowke.**

Smithsonian Institution, Bureau of Ethnology, J. W. Powell, Director. Archæologic Investigations in James and Potomac Valleys. By Gerard Fowke. Washington: Government Printing Office, 1894. Size 10 × 6½, pp. 80. *Illustrations. Presented by the Smithsonian Institution.*

United States—New Jersey. **Gannett.**

A Geographic Dictionary of New Jersey. By Henry Gannett. Bulletin of the United States Geological Survey, No. 118. Washington: Government Printing Office, 1894. Size 9 × 6, pp. 132. *Presented by the U.S. Geological Survey.*

An index, with a few descriptive words under each name, of the Geological Survey's 1-inch topographical map of New Jersey in forty-nine sheets.

United States—Niagara. *Blackwood's Mag.* (1895): 430–444. **Forbes.**

Harnessing Niagara. By George Forbes.

An account of the utilization of the water of the Niagara river for the electrical transmission of power.

SOUTH AMERICA.

Andes. *Deutsche Rundschau G.* 17 (1895): 560–562. **Greger.**

Der Weg über die Cordillere zwischen Argentinien und Chile. Von J. Greger. *With Illustrations and Map.*

Argentine and Chilian frontier. *B.I.G. Argentino* 16 (1895): 3–16. ———

Nuestros limites con Chile.

Argentine and Chilian Frontier. *Globus* 68 (1895): 112–114. **Polakowsky.**

Die Grenze Argentiniens gegen Chile. Von Dr. H. Polakowsky.

Argentine Republic and Paraguay. **Doering.**

B.A. Nacional Ciencias Córdoba 14 (1894): 117-292.

Observaciones magnéticas ejecutádas de 1884 á 1888, en la República Argentina y el Paraguay, con un magnetómetro de desviación. Por Oscar Doering.

Argentine Republic—Caingua Indians. **Ambrosetti.**

B.I.G. Argentino 15 (1895): 661-744.

Los Indios Cainguá del Alto Paraná. Por Juan B. Ambrosetti. *With Illustrations.*

Guiana—French Explorations. **Froidevaux.**

Explorations Françaises à l'intérieur de la Guyane pendant le second quart du XVIII^e siècle (1720-1742). Par M. Henri Froidevaux. (Extrait du Bulletin de géographie historique et descriptive, 1894.) Paris: Imprimerie Nationale, 1895. Size 10 × 6½, pp. 90. *Maps. Presented by the Author.*

Venezuela. **Goering.**

Vom tropischen Tieflande zum ewigen Schnee. Eine malerische Schilderung des schönsten Tropenlandes Venezuela. In Wort und Bild von Anton Goering. Leipzig: Adalbert Fischer's Verlag [n. d.]. Size 17 × 13, pp. 78. *Map, Coloured Plates, etc.*

An enthusiastic description of the natural characteristics of Western Venezuela as studied by the author during a long sojourn in the country. The illustrations are from paintings and sketches by the author, and the beautiful reproduction of the large pictures gives a vivid idea of the wealth of colour in plant, soil, and sky as one ascends from the tropical plains of Marecaibo to the eternal snow of the Cordillera.

AUSTRALASIA AND PACIFIC ISLANDS.

Australia. **Calvert.**

The Exploration of Australia. By Albert J. Calvert. London: G. Philip & Son, 1895. Size 11½ × 9½, pp. 236. *Map, Portrait, etc. Presented by the Author.*

This, we believe, is larger than any other of the voluminous works bearing Mr. Calvert's name, and the manner in which it is prepared by the publisher is almost perfect.

Australia—Physical Geography. **Barton.**

Outlines of Australian Physiography. By Charles H. Barton. Maryborough: Alston & Co., 1895. Size 7½ × 5½, pp. 180. *Presented by the Publishers.*

One of the soundest and best-written descriptions of the physical features and conditions of Australia. Perhaps a little advanced for a University extension audience—to which they were delivered as lectures—the chapters succeed in giving prominence in due proportion to many facts in physical geography as exemplified in Australia. It would have been better to avoid the too general title of Physiography.

GENERAL.

Educational. **Robertson.**

The Geographical Congress and Geographical Education. By C. Robertson, M.D. Edinburgh: St. Giles' Printing Co., 1895. Size 7 × 5, pp. 12. *Presented by the Author.*

Dr. Robertson supposes that geographical education is vitiated by teaching that the Earth is a planet; but it is difficult to see how the ordinary topographical and physical aspects of the Earth's surface, which are studied purely as they exist, and taught without any dependence on astronomical theories, can involve those questions as to the size and distance of the Sun in which he finds such serious difficulties.

Historical—Vespuccius. **Harrisse.**

Americus Vespuccius. A Critical and Documentary Review of Two recent English Books concerning that Navigator. By Henry Harrisse. London: B. F. Stevens, 1895. Size 9 × 6, pp. 72. *Frontispiece. Price* 10*s.* 6*d.*

The two books reviewed are Mr. C. R. Markham's 'Vespuccius' in the Hakluyt series, and Mr. Coote's reprint of an alleged voyage of Vespuccius. Mr. Harrisse sums up his criticism thus: "One of these sets forth deductions from imaginary premises; the other is a sheer imposture, dating from the beginning of the sixteenth century and now unconsciously revived."

Travels. **Archduke Franz Ferdinand.**

Tagebuch meiner Reise um die Erde. 1892–1893. Erster Band. Wien: Alfred Hölder, 1895. Size 10½ × 7½, pp. 574. *Maps and Illustrations. Presented by the Publisher.*

The Archduke Franz Ferdinand of Austria made a trip round the world in the Austrian warship *Elizabeth*, and he has now published a magnificent volume, giving an account of his experiences in the early part of the cruise. The greater part of this volume is occupied with the Archduke's visit to India, where he spent two months, visiting all the places of interest, and forming some acquaintance with the native princes as well as the British officials.

NEW MAPS.

By J. Coles, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Ordnance Survey.**

Publications issued between August 8 and September 7, 1895.

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England and Wales:—**Lancashire**, 118 s.w. **Yorkshire**, 2 s.w., s.e., 5 s.e., 6 s.w., s.e., 6a s.e., 6b s.e., 7 n.w., s.w., 12 n.w., 13 n.e., s.w., s.e., 14 s.e., 16 n.w., n.e., s.w., s.e., 17 s.w., s.e., 18 n.e., s.e., 19 n.w., 23 n.e., s.w., s.e., 24 n.e., 25 n.w., n.e., 26 n.w., s.w., 27 n.w., n.e., s.w., s.e., 28 n.w., s.w., 29 n.w., n.e., s.w., 38 n.w., n.e., 39 n.e., s.e., 40 n.w., n.e., s.e., 41 n.w., s.e., 42 n.w., 43 n.w., 52 n.w., 53 n.e., s.e., 54 n.w., s.e., 55 n.w., n.e., 62 n.e., 67 n.w., 68 n.w., s.w., s.e., 72 n.w., 74 s.w., 84 n.e., 85 s.e., 101 n.e., 1s. each.

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6-inch—County Maps:—

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25-inch—Parish **Maps:—**

England and Wales:—**Cornwall**, XLVI. 10. **Devonshire**, CXXIII. 10, 3s. each.

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England and Wales. **Johnston**

W. & A. K. Johnston's Railway Map of England and Wales. Revised by the various companies. Also showing canals. Scale 1 : 520,000 or 8·2 stat. miles to an inch. W. & A. K. Johnston, Edinburgh and London. *Presented by the Publishers.*

This map has been specially prepared to show the railways and canals of England and Wales. Great care has evidently been taken to bring the railways up to date.

Germany. **Königl. Preuss. Landes-Aufnahme.**

Karte des Deutschen Reiches. Scale 1 : 100,000 or 1·6 stat. mile to an inch. Sheets:—143, Bremerhaven; 514, Wunsiedel; 645, Donaueschingen; 646, Überlingen; 658, Stühlingen. Herausgegeben von der Kartogr. Abtheilung der Kgl. Preuss. Landes-Aufnahme, 1895. *Price of each sheet,* 1·50 *mark.*

ASIA.

Borneo. **Molengraaff.**

Stromkarte von West Borneo. Nach den Aufnahmen der topographischen Brigade der Niederländisch-Indischen Armee 1886–1895, mit Angabe der Stationen und Routen der Niederlandischen Expedition in den Jahren 1893 und 1894, von Prof. Dr. G. A. F. Molengraaff, 1895. Scale 1 : 2,000,000 or 31·6 stat. miles to an inch. Petermann's 'Geographische Mitteilungen.' Jahrgang, 1895, Tafel 14. Justus Perthes, Gotha. *Presented by the Publisher.*

Indian Government Surveys. **Surveyor-General of India.**

India, 64 miles to an inch, April, 1895, 2 sheets.—Telegraph map of India, 32 miles to an inch, 1894, 6 sheets.—Railway map of India, 48 miles to an inch. Railway brought up to March, 1895, 4 sheets.—Indian Atlas, Quarter Sheets: 4 miles to an inch, No. 31 N.E., parts of districts Ferozepore and Ludhiana, and of Patiala, Nabha, Faridkot, and Jind (Native States), Punjab; 87 N.W., parts of districts Khari, Bahraich, Sitapur, Barabanki, and Gonda of Oudh; 87 N.E., parts of districts Gonda and Bahraich (Oudh), Basti, and Gorakhpur (N.W. Provinces); 90 N.E., parts of districts Bilaspur (Central Provinces), Korea, and Sarguja (Chota Nagpur), and Sohagpur (Rewah); 91 N.W., parts of districts Bilaspur, Balaghat, and Raipur (Central Provinces); 125, parts of districts Khasi and Jaintia Hills, Sylhet, and Cachar (Assam).—A Chart on Mercator's projection of the Tidal and Levelling Operations of the Survey of India Department, 1858–1859, showing approximate cotidal lines.—North-West Provinces and Oudh Survey, 1 inch to a mile. Sheet No. 84 (2nd edit.), districts Buduan, Bareilly, and Pilibhit, Seasons 1867 to 1871, and 1877–78.—Upper Burma Survey, 1 inch to a mile, Sheet No. 258, district Mandalay, Season 1890–91.—Bengal Survey, 1 inch to a mile, Sheet No. 292, district Darjeeling, Seasons 1861–67 and 1880–81; No. 376, district Mymensingh, Seasons 1853–56; No. 388, districts Mymensingh and Pylhet (Assam), Seasons 1854–56 and 1861–62.—Hyderabad Survey, 1 inch to a mile, Sheet No. 211, Khamamet Circar, Seasons 1827–28 and 1837–38.—Central India and Rajputana Survey, 1 inch to a mile, Sheet No. 396, parts of Bhopal (C.I. Agency), and districts Hoshangabad and Narsinghpur (Central Provinces), Seasons 1862–64 and 1871–72; No. 409, parts of districts Saugor, Narsinghpur, Central Provinces, and Native State of Bhopal (Central India Agency), Seasons 1862–64 and 1871–72; No. 480, parts of Rewah State (Central India Agency) and Mirzapur District (N.W. Provinces), Seasons 1864–65, 1881–83, and 1885–86.—South-Eastern Frontier, 1 inch to 4 miles, Sheet No. 2 S.W., parts of districts Akyab and Kyankpyu (Lower Burma), of Pokokku (Upper Burma), and of Chittagong (Bengal), Seasons 1853–61 and 1887.—South-Eastern Frontier, 8 miles to an inch, No. 3A (2nd edit.), districts Bassein, Myaungmya, and Thongwa, and parts of Sandeway, Henzada, Tharrawaddy, and Hanthawaddy (Lower Burma), April, 1895.—Sindh Revenue Survey, 4 miles to an inch, Sheet No. 1, districts Jacobabad, Shikapur Rohri, Khairpur, and Larkhana, with additions of Railways to 1895; No. 2, districts Jacobabad, Shikapur Rohri, Khairpur, with additions to Railways to 1895.—Survey of India Department, Chart of Triangulation of No. 18 Party (Himalaya), Scale 2 miles to 1 inch, Sheet No. 313 (Punjab), Seasons 1886-1891.—Preliminary Chart, No. 45 of the Coast Triangulation, showing the positions of Beacons and other points fixed, Scale 2 miles to an inch, Indus Delta between Karachi and Sisa Creek, Season 1893–94.—Map showing the scene of operations of the Chitral Relief Force, 24 miles to an inch, taken from the map of Afghanistan, 1889, with corrections to date, April, 1895.—Map of the North-West Provinces and Oudh, 32 miles to an inch, accompaniment to the Annual Administration Report, N.W. Provinces and Oudh, P. W. D. and R. Branch, for the year 1893-94, with additions to March, 1895.—Map of the Central Provinces, 32 miles to an inch, with additions to Railways, March, 1895.—Bombay Residency (exclusive of Sind), 32 miles to an inch, with additions to Railways up to 1894.—His Highness the Nizam's Dominions, including the assigned districts of Berar, 16 miles to an inch, with additions and corrections to April, 1892, 2 sheets. District Palamau (Bengal), 12 miles to an inch, 1893.—District Patna (Bengal), 8 miles to an inch, 1889.—District Khulna (Bengal), 8 miles to an inch, 1890.—District Noakhali (Bengal), 10 miles to an inch, 1890.—District Umballa (Punjab), 8 miles to an inch, 1895.—District Sailkot (Punjab), 8 miles to an inch, 1895.—District Muzaffargarh (Punjab), 16 miles to an inch, 1895.—District Ghazipur (N.W. Provinces and Oudh), 8 miles to an inch, 1895.—District Lohardaga (Lower Provinces, Bengal), 4 miles to an inch, March, 1895.—Madras Survey, Index to the Survey Operations in Madras, Sheets Nos. 1 and 2.—Punjab Survey, Index to the Survey Operations in the Himalayas, showing sheets published on the 2-inch and 4-inch Scale. —Index to the Standard Sheets of the Bombay Presidency, Sheets Nos. 1 and 2.—Index to the Standard Sheets of Madras, sheets Nos. 1 and 2.—Index to the Standard Sheets of H.H. the Nizam's dominions and assigned districts of Berar.—Survey of India Department, Conventional Signs to be used on Topographical Maps.—*Presented by H.M. Secretary of State for India, through India Office.*

AFRICA.

Algeria. **Service Géographique de l'Armée, Paris.**

Carte topographique de l'Algérie. Scale 1:50,000 or 1·26 inch to a stat. mile. Service géographique de l'Armée, Paris. Sheets:—No. 29, El. Milia; 30, Aïne Kechera; 47, Oued Amizour; 48, Ziama; 71, Djemila. *Price 1fr. 50c. each sheet.*

Congo State. **Du Fief.**

Carte de l'État Indépendant du Congo, dressée d'après les itineraires originaux des agents de l'État et d'autres voyageurs. Par J. du Fief, Secrétaire-général de la Société royal belge de géographie. Scale 1:2,000,000 or 31·6 stat. miles to an inch. 4 sheets. *Presented by the Author.*

This is an important map of the Congo Free State, in which all the most recent and reliable information has been embodied. All the principal routes of travellers are laid down in red, together with the dates at which their journeys were made. An enlarged map of the country lying between Stanley pool and the coast, is given, as well as other insets.

French West Africa. **Pobéguin.**

Colonie de la Côte d'Ivoire. Carte dressée par H. Pobéguin, Administrateur Colonial. Levers exécutés en 1893–1894. Scale 1:150.000 or 2·3 stat. miles to an inch. *Presented by the Ministère des Colonies, Paris.*

These are four sheets of a large-scale map, in course of publication, of the French colony of the Ivory Coast, drawn from route-surveys made by M. H. Pobéguin, the Colonial Administrator. The elevations are shown by contour-lines and shading, and the author's routes are laid down.

French West Africa. **Levasseur.**

Cartes des Régions Méridionales de la Guinée et du Soudan Français. Dressée par M. le Capitaine Levasseur, de l'Infanterie de Marine, d'aprés les travaux antérieurs et ceux de MM. Andlauer, Berge, Bourgeron, Bourgeoise, Briquelot, Bunas, Ducarre, Lecerf, Levasseur, G. Maritz, P. Maritz, Mazoyer, Meyer, Morin, Morisson, Privey, Robert, Scal, Voulet. Officiers de la Colonne expéditionnaire du Soudan, Commandée par M.

le Colonel Combes, 1894. Service géographique des Colonies. Paris. Scale 1 : 500,000 or 7·9 stat. miles to an inch. 2 sheets. *Presented by the Ministère des Colonies, Paris.*

The result of all the French explorations in the southern portion of French Guinea and Sudan are shown on this map. All routes are laid down, and the map shows the large amount of information which has been collected by French officers and explorers in this part of Africa. It includes the country from the west coast to 60° 40′ longitude west of Greenwich, and from latitude 8° 10′ N. to 9° 50′ N.

Madagascar. **Hansen.**

Madagascar. Carte manuscrite très détaillée reproduite en photographie, dressée à l'aide des itinéraires des voyageurs. Par J. Hansen. Cartographe du ministère des Colonies et de la Société de Geographie, de Paris, 1895. Scale 1 : 750,000 or 10·8 stat. miles to an inch. *Price of complete Map in 11 sheets, 70fr.*

These are the first four sheets of a map of Madagascar which is in course of publication. The present issue includes the northern portion of the island, reaching within a short distance of the capital. The map has been compiled by Mr. Hansen from all valuable material. The routes of travellers and tracks which serve as means of communication between different places are laid down. It has been produced by a photographic process, and is thus a facsimile of Mr. Hansen's original drawing. In addition to the principal map, insets are given, on an enlarged scale, of places of importance.

Timbuktu. **Hourst and Bluzet.**

Carte de la région de Timbouctou au 1 : 500,000 or 7·9 stat. miles to an inch. Dressée par M. le Lieutenant de Vaisseau Hourst, Commandant la Flottille du Niger, et M. le Lieutenant Bluzet de l'Infanterie de Marine, d'après la carte Caron et Lefort, les travaux des officiers de la Flottille, les itinéraires et renseignements des officiers de la région. Publiée par la Société de Géographie de Paris en Août, 1895, avec l'autorisation de M. le Ministre de la Marine. *Presented by M. Paul Vuillot.*

This map contains a considerable amount of new work. The position of Timbuktu has been placed farther east, and an amount of detail to the west of Timbuktu, including Lake Faguibine, is given. There are insets of the Niger in the vicinity of Timbuktu, and the environs of Gundam, and the limits of the inundations of the Niger are indicated. The map is very clearly drawn, and a full explanation is given of the symbols used, as well as a list containing the names of the officers whose surveys have been used in the compilation of the map.

AMERICA.

Argentine Republic. **Hoskold.**

Mapa topográfico de la República Argentina. Scale 1 : 2,000,000 or 31·6 stat. miles to an inch. Construido sobre las datos mas recientas, y dedicado al Exm°. Gobierno de la Nacion, por H. D. Hoskold. George Philip & Son, London & Liverpool, 1895. 10 sheets. *Price* £2 10*s*. *Presented by Messrs. J. Philip & Son.*

This map, which consists of ten sheets, has been prepared from the maps of Mr. H. D. Hoskold, C.E. It is coloured to show the political divisions, and there are insets showing tables of heights and distances, together with sections of the principal mountain ranges and a plan of the city of Buenos Ayres. The map is very nicely drawn, and is well suited for general reference, and the scale being sufficiently large to admit of considerable detail.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published during July and August, 1895. *Presented by the Hydrographic Department, Admiralty.*

No. Inches.
173 m = 1·15 Gulf of Finland:—Approaches to Helsingfors and Sveaborg. 2*s*. 6*d*.
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809 m = 1·71 Tasmania, south coast:—Frederick Henry and Norfolk bays. 2*s*. 6*d*.

978 m = various. Kusaie or Ualan island and anchorages:—Kusaie or Ualan island (Strong island), Coquille harbour, Chobrol harbour, Port Bérard, Port Lottin. 2*s*. 6*d*.

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2867 m = various. Islands and anchorages in the North Pacific Ocean:—Fanning island, English harbour, Washington island, Christmas island, west side and entrance to the lagoon of Christmas island, Johnston (Cornwallis) island and reef, Johnston (Cornwallis) island anchorage, Palmyra island. 2*s*. 6*d*.

1128 Ports Conte and Alghero, etc.:—Plan added, Gulf of Oristano.

856 New plan, Rannon anchorage, and plan added, Rodd's anchorage.

(*J. D. Potter*, *Agent*.)

Charts Cancelled.

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106 Palmas bay	New Chart. Palmas bay	106
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2337 Sitka sound	New Chart. Sitka sound	2337
686 Fénérive, Foule point anchorage 689 St. Lucia bay, Fort Dauphin anchorage, Ytapére bay	Reproduction on new chart. Anchorages on the east coast of Madagascar	686
692 St. Augustine and Tullear bays	New Chart. St. Augustine and Tullear bays	692
702 Majamba bay	New Chart. Mahajamba bay	702
2762 Plan of Numa Choa anchorage on this sheet.	New Chart. Plans in the Comoro islands.	563
895 Allas Strait.	New Chart. Plans of anchorages in Bali, Lombok, etc.	895
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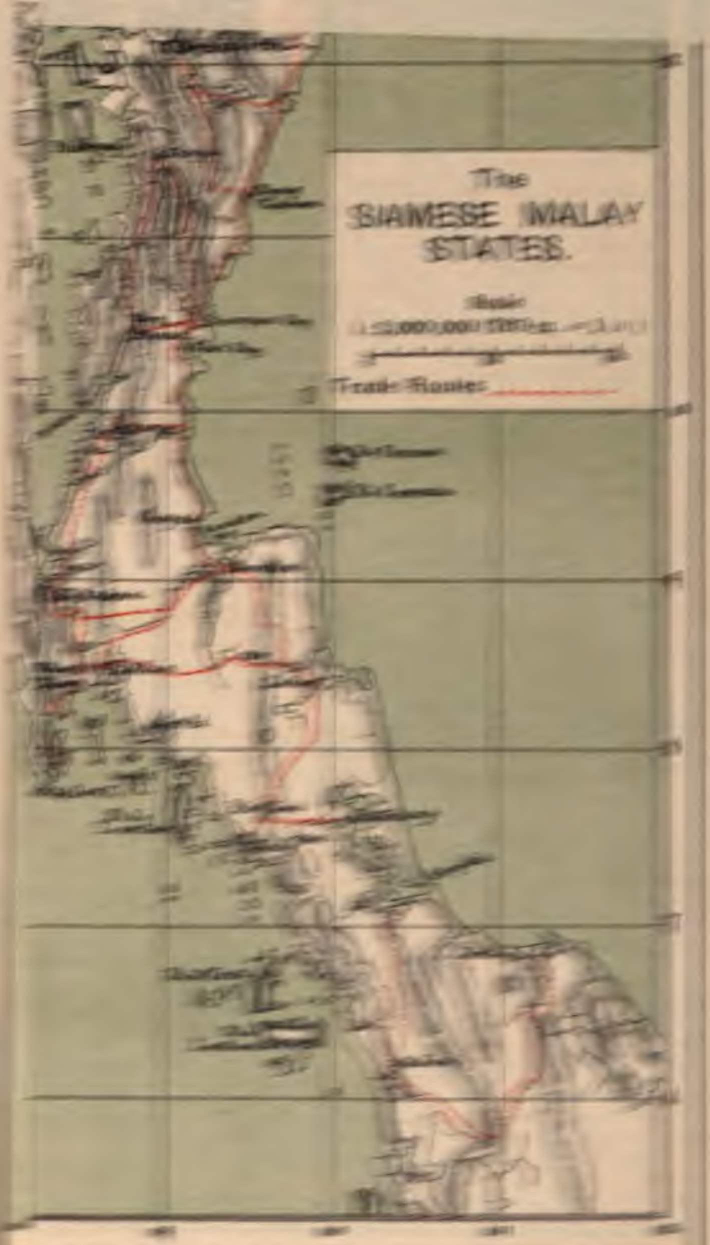
(*J. D. Potter, agent.*)

PHOTOGRAPHS.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.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Geographical Journal.

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OPENING ADDRESS BY THE PRESIDENT, SESSION 1895-96.

I FEEL obliged to refer to what took place at one of our meetings last session. I would remind you that neither the Council nor the Society, as a whole, is responsible for the statements made or the various opinions expressed in papers read at our meetings, or in the discussions which usually follow. In the discussion on the paper by Mr. Scott Elliot, some remarks on German officers were made by Mr. Stanley, which have given offence to our friends in Germany. I am sure that the meeting did not take those remarks literally or seriously, and we certainly had no sympathy with them. It would, therefore, be quite misleading for any one to assume that, because such remarks were allowed to pass unnoticed, they were approved.

In opening the Session you will expect me to refer to the great work of the recess, the success of which was due to the efforts of the Fellows of this Society. It is not, perhaps, for us to dwell upon the result of those efforts, but we may well rest satisfied with the judgments expressed by our foreign guests who attended the International Geographical Congress. There have been numerous reports and articles on the Congress in nearly all the countries of Europe and in the United States by eminent geographers, and many private letters, and they are unanimous in expressing their sense of the great success of the Congress as regards its scientific objects, and their satisfaction at the way in which they were received in this country. Among many others, I may mention the very appreciative reports by M. de Lapparent, the President of the Central Committee of the Paris Geographical Society; by Dr. Wegener, of Berlin; by Dr. Supan, of Gotha; by Prof. Penck, of Vienna; by Prof. Kan, of Amsterdam; and by Prof. Ricchieri to our colleagues in Italy.

The amount subscribed was £4265: and, with the exception of £5 contributed by the general public, the whole was received from Fello of our Society (£2562); or from the Government and public bodi (£1143). There were 1500 members of the Congress, of whom no l than 500 were foreigners; and the suitable reception of our gue affected our national credit, and became a public duty. This w recognized by Her Majesty's Government. We have cause to specially grateful to His Royal Highness the Duke of York, for t *éclat* his presence and his admirably delivered address gave to the ope ing meeting. This, together with the grant of £500 by the Treasur and the good offices of other public departments, gave a semi-offici character to the reception of the foreign delegates. It was thus official recognized that our success was a matter of national concern, as undoubtedly was, because if the bonds of friendship and good-wi between the people of this country and our neighbours have be strengthened through our efforts at the Congress, a public service h been rendered. We may rest assured that our foreign guests left the shores well satisfied with their reception, and with the most friend feelings towards their hosts.

There are, I consider, three measures which will make the Lond meeting a fresh starting-point in the history of these Geographic Congresses, and will tend to ensure equal or greater results from the assembly in the future. The first is our introduction of a system consultation on all important questions by an International Committ of Vice-Presidents. This plan gave coherence to the proceedings, a it was very striking to see with what harmony and good-will t eminent geographers of various nationalities worked together. T second measure is the continuance of the President and secretaries i office until the next meeting; and the third is the resolution by whi all the geographical societies of the world are placed in communicati with the permanent officials of the Congress.

I congratulate the Fellows of this Society on the great and mem rable success of their efforts, and I thank them most heartily a sincerely for the generous and zealous way in which they responded my appeals, and worked to secure that success. The volume containi the addresses and papers read at the Congress is being edited by D Mill, and will be available for all members early in the ensuing year.

Turning from the past to the future, we have the prospect of active and interesting session before us. The news of the success the enterprise of Dr. Donaldson Smith in Africa is most welcome. has penetrated to the shores of Lake Rudolf from Somaliland, in t face of great difficulties, and has reached the coast at Lamu; so th we may soon expect to welcome him in this country. A telegra has been received stating that Mr. and Mrs. Littledale have arriv in Kashmir, and we hope to welcome them during the course of t session, after their adventurous journey in Tibet. We also anticipate the reception of several important papers of a more specially scientific character, and the afternoon meetings in the Society's map-room, which were commenced in the last session, will be continued.

As President of the International Geographical Congress, it has become my duty, in compliance with the terms of a resolution, to represent the importance of Antarctic exploration to the First Lord of the Admiralty. We shall certainly do our best to secure the great end in view; if not now, at least when happier times arrive. It has been our conviction that, while much exploring work can well be executed through private enterprise, there are some services of this kind which are better done under Government auspices. Antarctic exploration, combining a magnetic survey, is one of the latter. In times past our Governments have ever been prompt to undertake such work, knowing that they were representing the feelings and wishes of the people. If this is not the case now, we must resort to the other alternative, and strive to do this great national work ourselves.

For private enterprise has done and is doing glorious work in the interests of geographical science. We have all been deeply interested in the return of the *Windward*, and in the news she has brought of the proceedings of the gallant explorers in Franz Josef Land. You are longing to hear this news at first hand, and I will now, therefore, introduce Mr. Montefiore, who has done such good service in connection with the equipment of the Jackson-Harmsworth expedition, and request him to read his paper.

THE JACKSON-HARMSWORTH NORTH POLAR EXPEDITION: AN ACCOUNT OF ITS FIRST WINTER AND OF SOME DISCOVERIES IN FRANZ JOSEF LAND.*

By ARTHUR MONTEFIORE, F.G.S.

Two and twenty years ago—on August 30, 1873—the group of ice-covered islands known as Franz Josef Land was discovered accidentally by the Austro-Hungarian Expedition under circumstances of more than ordinary interest. For the *Tegethoff*, the ship of that expedition, had been beset off the coast of Novaia Zemlia on August 20, 1872, in 76° 22′ N. lat., 63° 3′ E. long., and throughout the succeeding autumn and a winter of exceptional severity had slowly drifted, first in a north-easterly, then in a westerly, and finally in a northerly direction. With the return of the sun in the early spring, and the gradual moderation of the climate, the explorers looked for that breaking up of the ice which would enable them to steer their ship on its course. For they had been held captive in the ice, carried by wind and current along a course which varied from day to day, and at a speed seldom exceeding a mile or two per diem. But the summer of 1873 brought no such escape, and as the month of August drew to an end, the explorers gave up all hope of their being able either to advance in the route they desired, or return to Europe to recoup the strength already threatening to succumb. Yet, just at the moment when their hopes seemed most baffled and their chance of escape least probable, the hour of a glorious discovery drew near. "Not a man among us," wrote Julius Payer, "believed in the possibility of discoveries;" and yet the long aimless drift of the *Tegethoff* had brought them to the most northern land yet discovered in the eastern portion of the Arctic Regions.

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* Paper read before the Royal Geographical Society, November 11, 1895.

For on August 30, 1873, when in 79° 43′ N. lat. and 59° 33′ E. long., the deep mist in which the ship lay enveloped suddenly lifted and left the northern horizon clear. There, away to the north-west, ranged the bold lines of lofty coasts and the glistening slopes of an ice-sheeted land. Separated from the ship by many miles of dense and rugged pack, and obviously a country to the last degree inhospitable, the sight of this land might well have checked the enthusiasm of the party, already enfeebled by exposure to ice and snow, and well entitled to be weary of the rigours of Arctic scenery. But it is scarcely necessary to remind this Society that both Weyprecht and Payer, our gold medallists, were true geographers and explorers, and that the men they commanded were loyal to the core. The sight of this land had turned the long melancholy drift of failure into a great and splendid success, for a new and hitherto unsuspected country had been discovered in a latitude higher than that of any known land in the eastern hemisphere. The possibilities it might afford of further advance into the unknown region about the North Pole were probably greater than those offered by any other route—in a word, the discovery was of the first magnitude, and Payer enthusiastically wrote, "There was now not a sick man on board the *Tegethoff*."

Here, and in this way, then, was Franz Josef Land discovered—Franz Josef Land, named in loyalty after the Emperor of Austria, in the same spirit which placed the name of our sovereign in the highest southern latitudes yet reached, and which led Peary to give to the termination of his northern advance, on July 4, 1892, the name of Independence Bay.

But the fate of long endurance, which up to this date had characterized the Austro-Hungarian expedition, dogged it to the end. Locked fast in the ice, and slowly drifting now north, now south, and now west, it was impossible to leave the ship even for the temporary satisfaction of an hour's examination of the coast; and although brief visits were made on November 1, 6, and 7, to the shores of what was called Wilczek Land, the position of the ship was so perilous, and the winter darkness so impenetrable, that nothing further could be done till the following spring. It was then that Payer made his memorable march up Austria sound, and, ascending Cape Fligeley, looked poleward over that mass of high land lying north of the 83rd degree, which, called by him Petermann Land, remains to-day the land of the greatest promise in the whole of the Arctic Regions.

Then, too, did he reveal the intensely Arctic character of Franz Josef Land, and lay down roughly, in his rapid march north and south, those coast-lines and glaciers which until the other day formed our only conception of the interior of Franz Josef Land. I need not add here the story of the ultimate abandonment of the *Tegethoff*, nor that of the ever-memorable retreat of the expedition in open boats and under circumstances of terrible privation; but their experience proved sufficient for a number of years to give Franz Josef Land, its configuration, its climate and its avenues of approach, a very bad name indeed. If the land could be safely made and safely left, it held out great possibilities; but the Austro-Hungarian Expedition had apparently made it clear that neither the one nor the other could be relied on—that the chance of the safety of an expedition was remote indeed.

It remained for our own countryman, Mr. Leigh Smith, to give Franz Josef Land a better name. As a matter of fact, we owe it to him and his interesting voyages in the *Eira*, that the general conception of the difficulty of reaching Franz Josef Land underwent, not merely a change, but a complete revolution. The voyage he made in 1880 served to emphasize, among other things, the great variation from year to year in the conditions of Arctic navigation. Over the very spot where the *Tegethoff* was abandoned, frozen fast in the solid pack, Mr. Leigh Smith steamed without difficulty in open water. The Austrian Expedition, beyond going almost due north and south to and from Cape Fligely, had only just touched the south-east point of M'Clintock island and, as we now learn from Mr. Jackson, guessed at the land on the west of Markham sound. It was Mr. Leigh Smith's plucky navigation in 1880 which revealed to us the southern coast of M'Clintock, Brady, Hooker, May Etheridge, Northbrook, Bruce, Mabel, and Bell islands; which opened up, headland after headland, the great western region he called Alexandra Land, with its capes Grant, Crowther, Neale, Ludlow, Lofley; which enabled him to explore Nightingale sound and the harbours of Gray bay and Bell island; to penetrate westward as far as 44° E. long., and as far east as 59° E. long.; and to show that intensely Arctic scene drawn by Payer might be modified—that at foot of the hills of eternal ice there ran, in the short summer, a na ribbon of green grass, flecked here and there with sprays of flow blue and yellow and white; and that, chief of all, no insuper difficulty was encountered either in approaching or leaving Fran Land, when the ship kept between the meridians of 45°

And again, in 1881, the accessibility of Franz Josef Land was proved with even more striking emphasis, for the northward route of the *Eira* lay between 45° and 50°, and showed scarcely any of the deviation and winding which usually characterize the track of ships passing through the pack. The unfortunate loss of the *Eira*, when in a position of comparative safety off the coast of Franz Josef Land, necessitated the wintering of the expedition on Franz Josef Land; and while this entailed some personal suffering and privation, it resulted in a valuable series of experiences and observations.

The fluctuation of the winter temperature; the immense quantity of fresh food supplied by bears, seal, and walrus; the open water that occurred even in mid-winter; and the early break up of the ice;—all served to present Franz Josef Land in a new and more favourable light to the Arctic explorer. For here was a land which we now learnt could be reached with fair fortune in any ordinary year; where winter quarters for the ship and land quarters for the explorers might be found; where abundance of fresh animal food was ready to the rifle; and where exploration might be carried on in the autumn and early spring on firm ice, and during the summer in open water by boat. The fact that Mr. Leigh Smith had no intention of wintering in Franz Josef Land, and that in consequence he had neither fur outfits nor sledging equipment, rendered it impossible for him to carry out any exploration during his enforced detention; but, in the course of his summer journey and his winter pursuit of fresh food, he learnt enough to add considerably to our knowledge of the islands off the southern coast of Franz Josef; and his careful husbanding of the strength and health of his crew, aided most efficiently as he was by Dr. Neale, was subsequently justified by the excellent work they performed when retreating to Novaia Zemlia in open boats.

Is it not a singular thing that, for eleven years subsequent to this remarkable proof of the great suitability of Franz Josef Land as a means of approach to the unknown North, not a single expedition should have been despatched to its shores? Expert opinion, basing its views mainly on the experience of Mr. Leigh Smith, was practically unanimous in placing Franz Josef Land above all positions in the Arctic Ocean, as the vantage point of a polar expedition. In the discussion which took place before this Society, after Mr. Clements Markham, then the honorary secretary of the Society, had read his interesting paper on Mr. Leigh Smith's discoveries, Sir George Nares declared that "he had opened up what, according to present lights, must be the future route to the pole." Captain Beaumont was of opinion that "Franz Josef Land appeared to offer the best facilities at present;" and Admiral Sir Erasmus Ommanney admitted that "we must now accept Franz Josef Land as the base for future operations." And, again, in 1883, after Mr. Markham had read a paper on the experiences of Mr. Leigh Smith in 1881 and 1882, expert opinion was similarly emphatic and unanimous. Sir Allen Young, who had gone out in command of the Leigh Smith Relief Expedition, and had met with the party at Matotchkin Schar, declared that "Franz Josef Land now appeared to be the only land, extending far to the north, by which such journeys could be made;" and emphatic, too, were the remarks made by Sir George Nares on the advantages which Franz Josef Land held out as winter quarters.

Still nothing was done to take up and continue the work which had begun so auspiciously. Arabs and ivory had taken possession of the geographical mind, and Arctic exploration was apparently forgotten. Yet there was one man who bore gallant testimony for a renewal of Arctic work, with a special appeal for the claims of Franz Josef Land—I allude to Admiral Markham, who in the *Isbjorn*, in 1879, had come very near indeed to sighting the southern coast. In his 'Life of Sir John Franklin,' he occupies the concluding pages of the volume with a strong presentation of the case for Franz Josef Land. He points out how experience favours and probability augurs for success in this remote part of the Arctic Region; and I do not think I am betraying a confidence when I say that it was Admiral Markham's opinion which weighed so strongly with Mr. Harmsworth, when he finally undertook to despatch an expedition to Franz Josef Land.

Yet, independently of this, and relying only on the experience of Payer and Leigh Smith, a young Englishman, who had already received baptism in Arctic waters, was thinking out a shrewd and plucky plan of discovery in the unknown polar area by way of Franz Josef Land. This countryman of ours was Frederick George Jackson. Early in 1893, on February 1, he communicated in a letter to the press an outline of the plan he proposed to follow on arriving at Franz Josef Land—a plan which was so carefully thought out and based on grounds so secure, that he is now pursuing practically the identical method he then advocated.

But at that time no munificent patron had come forward to provide the very large funds which a thoroughly well-equipped Arctic expedition demands; and Mr. Jackson himself was anxious to test, with a special view to the geographical conditions of Franz Josef Land, the various articles of a complete sledging equipment. It was this anxiety which led him to start in the summer of 1893 for the Samoyad settlement of Habarova and undertake his subsequent mid-winter sledging journey over the frozen Tundras. What good work he did, and how he accomplished, under severe climatic extremes, a journey of nearly 2500 miles, are narrated in simple and unaffected language, eminently characteristic of the author, in his book, 'The Great Frozen Land.' This book was published as recently as this year, and was without exception most favourably received. Unquestionably, it gives us the best and most authoritative account in the English language of the remnant of a primitive folk—the Samoyads—and the only description which exists of Waigatz island and the Great Tundra lying between the Ob and the Pechora. Among works of Arctic travel it occupies a unique position, and must be consulted by every student of Arctic geography and anthropology.

It was during Mr. Jackson's absence on this adventurous and arduous journey that I had the good fortune to make his work and projects known to Mr. Alfred Harmsworth. There was no occasion to dwell on the scientific value of polar exploration, nor on the desirability of England once again assuming her rightful place in the van of Arctic discovery; for in Mr. Harmsworth I found a close student of the history of polar exploration, and all the ardour of an enthusiast. For many years he had read and noted all that went on in connection with this fascinating branch of geographical work, and he was perfectly aware of its needs and demands. Moreover, I found in him an eager, an uncompromising patriot; one who desired above all to see the Union Jack again going forward across the unknown and unexplored regions of the polar basin. With the keenest admiration for the persistent pluck of Peary and the hardihood of Nansen, he was at the same time almost impatient to see an Englishman take up this great work of endeavour and endurance, and uphold in the far North those undying laurels which were won by the labours, the lives, ay, and the deaths, of a long line of our illustrious countrymen.

With his decision to send Mr. Jackson in command of a fully equipped expedition, the genesis of the Jackson-Harmsworth Polar Expedition was complete, and its projects and some of its accomplishment are now familiar to you.

In the month of June, 1894, Mr. Jackson read a paper before this Society, in which he dwelt on the plans he hoped to pursue, and described the more novel parts of the equipment with which he was so abundantly provided. For the details of that paper, I must refer you to the issue of our *Journal* published in August of last year; it is sufficient for me merely to mention here that on arriving at Franz Josef Land he intended the expedition to become almost entirely a sledging expedition, and that the sledges and boats were of a type specially adapted to the purpose in view. The *Windward*—a whaler of excellent record, which had been purchased and fitted out by Mr. Harmsworth—sailed from Greenhithe on July 12, and arrived on the 31st at Arkhangel, where she took in the log-houses, ponies, and Samoyad fur outfits which have proved so unqualified a success during the past year. Thence she sailed to Habarova, where the Siberian dogs were shipped; and then she turned north toward the ice-pack and that land of promise which the Austrians had discovered two and twenty years before. From the date of her entering the pack all knowledge of her movements and fortunes became impossible, and it was only as recently as September, with her emergence from the pack and return to Europe, that we learnt the latest tidings of the expedition. The ship had been frozen in the pack almost as soon as she had reached Franz Josef Land, and on her southward voyage this year desperate and gallant had been the struggle against the odds of the heavy ice. Only now, indeed, has it become possible to tell, even briefly, the story of the last eventful year; and it is with peculiar pleasure, but with considerable diffidence, that I now attempt to obey the command laid upon me by our President, and give you in outline something of that story, interspersed as it is with tale of discovery, incident of work, and anecdote of sport.

The *Windward* left Khabarova on August 16, and on the 17th entered a quantity of drift-ice, and soon after met with heavy fog, which continued, off and on, for several days. On the 20th the ship ran during the fog into a shallow bight of ice, but returned to the edge of the pack, proceeding in a north-westerly direction. On the 22nd, after experiencing a moderate south-west gale, with considerable sea, the ship reached the pack. This was in 76° 49′ N. lat. and 49° E. long. The ice proved thick and formidable, and it was not until the 24th that a lead was found in 78° 11′ N. lat. and 41° 44′ E. long. This possibly formed the channel between the two main masses of Spitzbergen and Franz Josef Land ice. The ship steamed up it almost in open water.

At 5.30 a.m. on the 25th Franz Josef Land was sighted, the *Windward* being then about 30 miles south of Bell island. Here, however, a heavy pack was encountered, and for the next two days little progress was made. Anchored to a floe, the ship drifted westward, but subsequently she steamed to the southward and eastward, hauling up to the north and east as much as possible.

The ice still proved unnegotiable to the northward, and the ship bore away to the eastward until stopped by a heavy pack. On the 27th she turned and went westward, and attained 79° 22′ N. lat. and 46° 8′ E. long. on the 28th. Shifting from floe to floe, some more northing was made, but on the 30th a south-west course had to be shaped to avoid heavy drifting ice. On the following day ten miles northing was made, and then again a south and easterly course became necessary, and an attempt was made to get at the back of the eastern barrier to which I have referred. When in position 79° 8′ 44″ N. lat. and 45° 10′ 15″ E. long., the course was shifted to north-east, and soon after clear water was visible ahead, and Cape Neale was sighted about 4.30 on September 1. The ship was again stopped by ice when 40 miles south of Cape Grant. The ice-master—John Crowther—believed that this ice had never broken up during the summer, and the ship once more had to steam south. Her position was at this time 78° 59′ N. lat., 46° 55′ E. long. On the 5th the ice was in a condition to ram, and at noon Bell island was bearing N. 51° E., and only 15 miles distant. On the 6th the ship was again stopped by heavy ice and a thick fog; but on the following day she was able to force her way through into the open water, and made Bell island at noon. Franz Josef Land had at last been reached.

Mr. Armitage, writing at Mr. Jackson's request, says of the approach to Franz Josef Land, "When the ship returns in 1896, the captain will probably find an open lead of water in 78° N. lat., and somewhere between 40° and 50° E. long., which will take him nearly, if not quite, up to the land about Cape Flora. The lead lies, no doubt, between the Spitzbergen and Franz Josef Land packs. If he finds the ice still fast to the land, by no means let him give in, for our own case proves how late it may be before it comes away. If he seizes his opportunity as the ice opens out, and uses to advantage his knowledge of ice-movements, he is bound to get through. But he must not underrate the difficulties he will meet with when endeavouring to reach the land here. We found that it required continual watchfulness, determination, and perseverance."

Bell island did not afford much chance of safe quarters, especially as Eira harbour was blocked with ice. Moreover, Miers channel, the broad sound between Bell island and the road north, showed a strong current, which would indicate an early break up of the ice. The *Windward* steamed some way up the channel, and Mr. Jackson discovered a small island off Bruce island, which he named "Windward" island. They then proceeded to Cape Flora, examining that headland and the remains of Eira cottage, in which the Leigh Smith party passed the winter of 1881–82. The hut was in good state of repair, considering the lapse of time, and, being roofless, its exposure to the weather. Mr. Jackson then proceeded east to Cape Barents, keeping along the edge of the land floe; but on reaching this point he found it impracticable as winter quarters, and returned westward to Cape Flora.

On September 10 the work of discharging the great quantity of stores began, and all hands set to work—sixteen hours on and eight hours off—in the hope that it might be accomplished and the ship be ready to return before the season was too far advanced. Unfortunately, however, winter set in suddenly, and on the 13th the passage of the boats to and fro was stopped by the formation of new ice. Mr. Jackson then secured the ship in quarters safe for wintering, and at the same time favourable to an early release in the succeeding summer. She anchored in a small shallow bay on the south side of Cape Flora, in 5 fathoms of water, being quite out of the running pack and current, and protected from the pack, which a southerly gale or a strong tide might drive shoreward, by some grounded bergs. The ship secured, and the ice having now become firm, the work of discharging continued steadily, and by the end of October the two log-houses, observatory, and four store-houses had been erected, everything placed on shore, and everything in its place.

This is what Mr. Jackson says of the house, which he called "Elmwood," after Mr. Harmsworth's place in Kent: "Our house is situated on a raised beach, 115 feet above the sea, forming a wind-swept plateau, and thus kept nearly free of snow during the winter. The stable"—which was also built of logs—"is directly east of it, and the four folding-houses are in a line towards the same point. The latter proved quite useless as a residence, but came in as storehouses. The Russian house we have fitted up capitally, and lined with green baize, and it looks, and is, as snug as the inside of a gun-case. We sleep on the floor, rolling our blankets up during the day. I have not the smallest hesitation in saying that it is the best and most comfortable house ever put up in these latitudes. It has blown incessantly, often with very low temperatures, all through the autumn and winter, so we have been very glad of a good substantial house."

This house, which was expressly made for the expedition at Arkhangel, was built of large square logs 12 inches thick, morticed into each other, and well caulked with dried moss. The living-room was lighted by four windows, each with double frames, and was exactly 20 feet square. Under the same roof, however, there was a fair-sized storeroom and a convenient kitchen, opening into the entrance-passage. The living-room was carpeted and strewn with fur rugs, and lined with green baize. A large round table occupied the centre; bookcases and one or two small tables stood against the walls, and these, again, were made bright with a number of framed engravings and etchings. All manner of convenient appliances were fixed about the room, while just below the ceiling there stretched from wall to wall a complete and most useful series of racks. Stoves and lamps had been much discussed before the expedition left England, and the artificial light throughout the winter was not inferior in illuminating power to gas. It is not surprising, therefore, to find Mr. Armitage cheerily writing, as he does in a letter to me, "I can well picture to myself you sitting before your blazing fire during the dreary, cheerless months of winter; and how, as your thoughts turned towards the *Windward*, you mentally exclaimed, 'Poor beggars! I wonder where they are?' You will indeed be pleased to know that all that pity has been wasted, for we have been housed in comfort, and have lived in luxury."

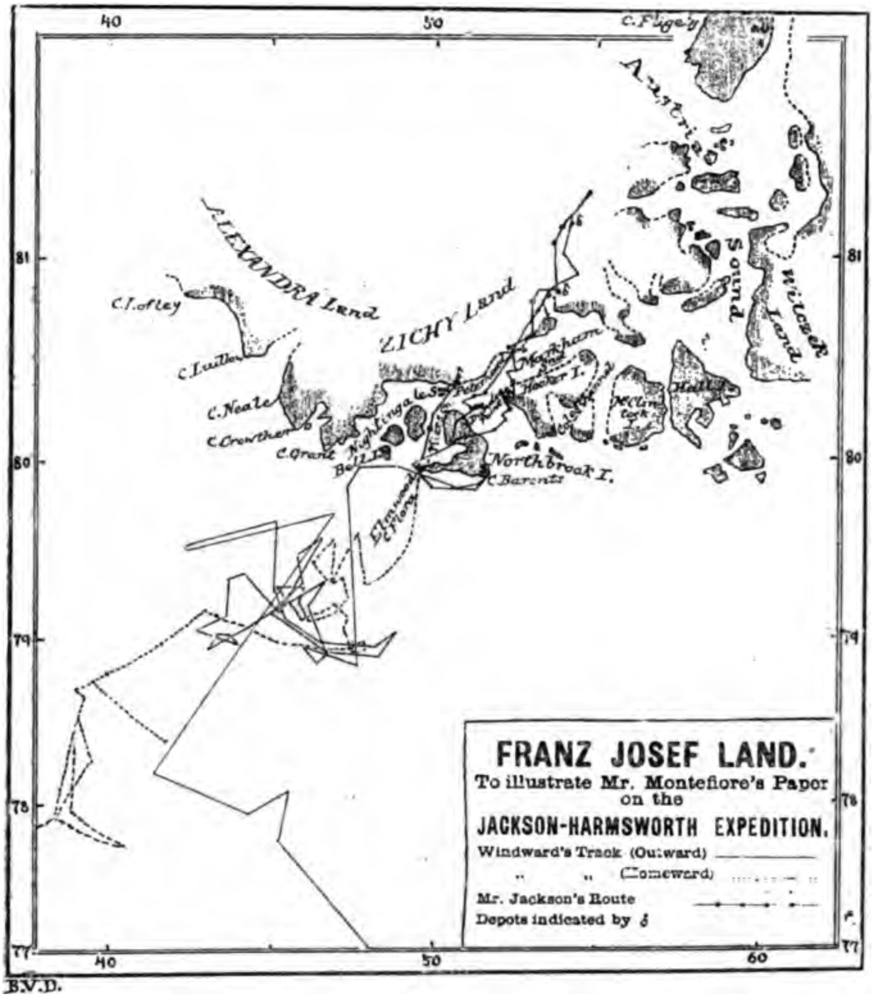
The work of discharging, the securing of the ship in her winter berth, and the erection of the head-quarters on Cape Flora, effectually prevented any journey into the interior during the short spell of autumn: but before the winter darkness had become too deep for travelling, Mr. Jackson was able to erect a depôt on Cape Barents, and cache there some [illegible] lbs. of meat, marking the site with a spar.

Throughout the winter the exploring party—eight in number—

remained on shore, while the crew, under the charge of the sailing master, were on board the *Windward*. Owing, however, to the illness of Captain Schlosshauer, the sailing master, Mr. Jackson had practically the charge of the ship, and almost daily visited her, and sent on board fresh bear and walrus meat and a large number of birds. In order to obtain that exercise which he considered so necessary to the well-being of all hands, football and hockey were frequently played on a small piece of unusually smooth ice; the neighbouring country was repeatedly traversed; while the search for bears and their subsequent capture provided excitement as well as exercise. The bears' blood was most carefully preserved, and immediately frozen into lumps of handy size; and these were then ready to use in the savoury soups and stews provided by the cook. In adopting this plan, Mr. Jackson was following the example of Dr. Neale, and he was equally successful in keeping his party in good health. When the ship left Franz Josef Land this summer, the explorers were in the very best of good health and good spirits; and I have just heard that the botanist has written to a friend and said, "I have never known till now what good health really is." This is very satisfactory, and reflects credit all round.

To give some idea of how the expedition passed the winter, I may make a rough sketch of an average day. At 8.30 the bell rang for getting up, and each member had his day of the week for a hot bath before breakfast. Nine was the breakfast-hour—breakfast consisting of porridge, fish, tinned and bear's meat, bread-and-butter with jam or marmalade, and tea and coffee. Then the house was cleaned and tidied, and the man to whose lot it fell filled the water-barrel with a fresh supply of snow. This, of course, soon became drinking-water. Until noon work was the order of the day; one occupying himself with carpentry, another with lamp-cleaning, another with making harness, traces, etc., and another with copying maps or doing anything that was needed. From 12 to 2 exercise and recreation out-of-doors was the rule. At 2 p.m. lunch was served. This usually consisted of fish, meat, bread, butter, cheese, lime-juice, and cocoa. During the afternoon more work was done—there was always plenty of work—but after lunch this was chiefly out-of-doors. For example, the making and keeping clear the roads along the full length of this most northerly British settlement—whose village street was quite 100 yards long—was in itself a considerable labour. The roads were 10 feet in width, and by the end of the winter the banks on each side of them were some 15 feet in height. The getting out and re-arranging of stores, and a score and more of odd jobs were readily found.

I should also mention that every day of the ten months during which the ship lay frozen in the ice off Cape Flora, Dr. Reginald Kettlitz visited and examined the ship's crew, missing only one day out of the three hundred, and then on account of a temporary attack of illness. Mr. Sidney Burgess proved an admirable cook, and I have given you the bill of fare for breakfast and lunch. If I refrain from also giving that for dinner, it is because Franz Josef Land is not yet ready for a sudden rush of immigrants.



B.V.D.

Mr. H. Fisher, the botanist, is a capable amateur artist, and has made a number of sketches of considerable interest. Many photographs have been taken, and some of these have returned, but none of those taken in the interior. For these we must wait till next year. Dr. Kettlits and Mr. Fisher, I might add, regularly examined the contents of the bears' stomachs, with a view to their probable zoological and botanical interest. Mr. Jackson is not a believer in all work and no play, and football was played on a piece of smooth ice near Elmwood during the early part of the winter. Skating could only be indulged in during the mild weather, as leather boots could not be worn when it was cold. The evenings were usually spent in reading and writing, playing, chess, draughts, cards, and the like. The members of the expedition evidently passed these evenings pleasantly, as I cannot hear of any one turning in before midnight. This, then, may give you a rough idea of the way in which the long, dark, and dreary winter was enlivened and made something more than tolerable.

During the winter, Mr. Jackson found by experience that in some ways the reindeer sleeping-bags were not satisfactory, and he forthwith proceeded to test the capacity of a full outfit of Samoyad clothing to serve as the sole protection when camping out. Readers of his most interesting book, the "Great Frozen Land" (Macmillan, 1895), will remember his description of sleeping out on the Tundra in such an outfit, and it will be seen, from the following extract, that the experiment, when repeated in Franz Josef Land, proved equally satisfactory :—

"I tested myself all the sleeping-gear, etc., during the winter, sleeping out on the top of the flat roof without a tent, with the thermometer showing more than 70° of frost. On several occasions there was a gale blowing with more than 60° of frost—which is cool; so they had a fair test."

On March 10 Mr. Jackson started on a preliminary journey north. He was accompanied by Mr. Armitage, nautical astronomer, and Blomgvist, a Russian Finn, who had shipped as A.B.; and they were rationed for seven days. Taking two ponies and four sledges—the latter laden with 1700 lbs. weight of stores—they made a course between Northbrook island and Bruce island. For the first four days the weather was extremely unfavourable, the fog being very dense, and the driving snow so thick that it was impossible to make out the hummocks when only 50 yards away. The absence, too, of all shadow made it difficult to judge the ground or distinguish a rise from a depression, so that Mr. Jackson writes in a letter to Mr. Harmsworth, "One suddenly found one's self with a pony-sledge on the top of a high drift of hard snow with an abrupt drop on the other side, over which you step with a jerk. It was like travelling blindfolded." They kept going north, however, and, after crossing some very rough ice, finally made Peter Head, at the entrance to Markham sound. Here they established the first of the series of depôts on the line of their northern march, marking the spot by erecting two staffs, and hoisting the Union Jack. At this time the fog rendered it impossible to see anything of the country, and, the chief object of this preliminary journey having been attained, the sledges were turned southward, and Cape Flora was regained on March 16. Writing to Mr. Harmsworth of this reconnaissance, Mr. Jackson says, "We experienced some pretty cool weather, getting the thermometer down to −45° Fahr., but found our equipment quite satisfactory, sleeping warmly in our soviks, militzas, pimmies, and toboks. The ponies behaved splendidly, and looked fresh and well on their return; and if poor Franklin and Parry could see them clambering (clambering is the only word) over high piled-up hummocks of ice, I think they would be amazed. We all came back with our faces absolutely raw, and our hands, especially the fingers, being much blistered with frost-bites. . . . Armitage greatly pleased me by his cheerful, happy way; he was always jolly and active, and things must have been a trifle trying occasionally to a man unused to roughing it."

On his return to the head-quarters, Mr. Jackson was detained much longer than he had expected by a variety of circumstances, among them being the temporary break up of the ice in which the ship was frozen. I may conveniently here, therefore, say a few words as to the sport obtained during the winter and spring. Nearly sixty bears in all were killed by the various members of the expedition, and about half this number fell to Mr. Jackson's rifle. It will be remembered that the Leigh Smith party did not include one female in their total bag of thirty-four; but from Mr. Jackson's list I find that between the beginning of October and the end of March—distinctly winter months in Franz Josef Land—four females were shot. On the other hand, during the months of December and January only males fell to the rifle. This, the latest experience, is unquestionably in favour of hibernation, although it seems to restrict the period within a shorter time than has hitherto been allotted. Mr. Harmsworth has received reports of several exciting incidents in connection with these rather awkward neighbours, not the least noteworthy being the experience of the ship's carpenter, who, when more than a mile from the ship, was surprised by a huge bear, which measured, when ultimately killed, nearly 9 feet in length. The carpenter clambered to the top of a hummock, which afforded him some advantage; but the bear, rearing himself up on his hind legs, proceeded to follow him. This demonstration of good fellowship was not appreciated, I need scarcely say, by the carpenter; but he waited until the bear's muzzle was within a couple of feet or so of him, and then fired his revolver—the only weapon he had with him. As is the way with revolvers on occasion, it missed fire; and "Chips" would then have been in a very awkward corner had not some of the dogs, who had scented the bear, come up at the very nick of time and attacked him. This drew bruin's attention away from the carpenter, who availed himself of the opportunity to return to the ship. It remains to this day, I believe, an article of faith among many of his comrades that he covered that mile within record time.

In the course of one of his letters, Mr. Jackson writes of an exciting experience which befell him at the beginning of February last; and perhaps I ought to say here that all the matter which I have drawn upon regarding the progress of the expedition is contained in private letters sent home. You will, I know, make every allowance for my absent friend if his style is somewhat too "familiar" for a communication to a scientific Society like ours, and if in the course of this paper you have perceived gaps which you would like to have seen filled, and silences you would have preferred broken, I must ask you to remember that I have not only to regard the question of time, but also to respect the intention of the leader of the expedition. For he has sent back nothing ostensibly for publication, and all his maps, journals, observations, notes, and collections remain with him at Franz Josef Land. I have gone through his letters to Mr. Harmsworth, and it is from these and one or two written to me that I have been able to put together some account of the Geographical work which he has been able to accomplish.

But to return to the story I have promised; and I will give it in the narrator's own words:—

"In the early morning of February 7 I had a bit of a near squeak with a bear. I had gone off hurriedly by myself at 5 a.m., with just breeches and coat over my pyjamas, having just been on the point of turning into my blankets after being out all night bear-hunting.

"I heard the dogs again barking out on the floes, so I followed the barking for two miles to an open polynia of water, at the edge of which I found a big bear engaged in making rushes at the dogs, four of which were barking around him. I wounded him badly the first shot, and he took to the water. He came out of this again and made for Miers channel over the floe, with the dogs and me after him. As he was distancing me, I fired a long shot at him, but as it was dark and misty, with falling snow, I can't say if it hit him or not; but it had the effect of making him return to the edge of the water he had left, where I came up with him again, and found him about thirty yards from the edge of it, uttering deep roars and hisses, and making rushes at the dogs. As I had left the house hastily with only three cartridges, and had fired two, I had now only one left. So, wishing to make sure of a fatal shot, I went up to within six or seven yards of him, when he rushed at me, at first with his head down. At this I fired, but just as I did so he raised it, and my bullet went between his legs. In another instant he was upon me, with his jaws wide open and a regulation menagerie roar. I had just time to ram the rifle-barrel with all my force into his mouth and draw it back for another thrust. This was apparently a trifle too much for him, as he whipped short round and took to the water. I would have given a 'tenner' for another cartridge then, as I could have killed him easily. As it was, I had to return to Elmwood for more cartridges, as I had still hopes of getting him. I there exchanged my single-barrelled ·303 rifle for the double-barrelled ·450, so as to have a second barrel up my sleeve in case the recent accident should happen again. On returning I found he had crossed the water, and was about 150 yards off, out of further harm's way, but roaring dismally. There I was reluctantly obliged to leave him, no doubt to die, as there was no means of getting near him. My left hand was a little cut by his teeth when it entered his mouth in my thrust, and bled a good deal; and I found, on measuring afterwards, that the barrel must have penetrated his jaws 23 inches—a nasty jar for him, I should fancy. I have been charged during the winter and spring by several bears, but none got to such close quarters as this chap did. A bullet always stopped them. Polar bears are queer, uncertain animals; some are all funk and clear out, whereas others are as bold as brass and all fight, if it is inconvenient for them to run. Altogether they have afforded great entertainment during the winter, and have certainly done a great deal to relieve the monotony."

Two retrievers were taken out from England—presents to Mr. Jackson from Mrs. Harmsworth—and thirty Siberian dogs were taken on board at Habarova, having been brought from the Ob by the Russian Räving. Up to the date of the ship's leaving, not only had these dogs proved of the greatest use, but none had fallen victims to the climate or fatigue. Two had succumbed to a disease common to their kind, and one of the English retrievers, I am afraid, must be held responsible for the death of another. Mr. Jackson writes amusingly: "Carlo, by-the-by, has developed into a shocking blackguard, and is the sole representative of the criminal classes in Franz Josef Land. He now constantly wears a muzzle, which he usually has cocked over his left eye, giving him a very Bill Sykes-like appearance. He is the terror of the *Windward* people, and would kill every dog in the neighbourhood if allowed to go about unrestrained."

Three bear cubs which Mr. Jackson caught and sent home by the ship, destined for the Zoological Garden, came unfortunately to an untimely end while on the voyage, but they appear to have contributed their share to the hilarity of Elmwood. "They have no instincts," writes Mr. Jackson, "beyond feeding, biting, and scratching, but have afforded us great amusement. The interior of our house looked like a Zoo, having three bears, six pups and their mother—a Samoyad dog—as constant inmates for some time."

The winter night had come to an end with the reappearance of the sun on February 23. "Soon after this," writes Dr. Reginald Kettlits, surgeon to the expedition, "the advent of the first birds interested us not a little, and now that we have perpetual day, we have birds roosting and beginning to breed in the cliffs at the back of the house in their thousands. The dear little snow-bunting, the only small bird as yet, was specially welcome, for it reminds one more of home. It has a short but a sweet song."

At the beginning of April, the breaking up of the ice in which the ship was embedded threatened her with grave peril, being far too early in the season, of course, for any attempt at navigation. An easterly gale, with dense driving snow, had lasted from March 31 to April 4, and about noon on the latter day the ice suddenly broke up. There was literally not a minute's warning, and in a moment great rents ran across the floe and, with loud claps of thunder as it were, parted large portions of ice from the main pack. A whale-boat, sledge, and a small Union Jack were swept away and lost, and the whole of the port side of the ship, which had been firmly fixed in a mould of ice, was swept clean, and a large pool of open water left in its place. The starboard side was still held firm by the land-ice, and this, again, was held by the grounded bergs. Still, as there were no fires up and the ship had scarcely any ballast in her, the position was one of gravity. Mr. Jackson had several lines laid out and attached to the bergs, got ready for steaming, and set all hands to work ballasting the ship with ice. On the following day the gale dropped, and with it the snow ceased; and there was then revealed a great expanse of open water—east, west, and south. This, however, was not to last long; for on the same day a huge floe appeared moving rapidly down on the ship, but as the *Windward* had been prudently anchored just out of the run of the current, the floe, with a very dangerous V-pointed bow, crossed the water which had been opened on the port side of the ship, just missed the ship itself, and struck the land-floe beyond with a terrific crash, throwing up high hummocks, and making a scene of great confusion. Then, as if spent with the effort, it swung slowly round and, gently coming up to the ship, enclosed it once again. "Nothing," writes Mr. Jackson, "could have been better had it been ordered expressly for her." There she lay until her departure in July. The running pack came and went with the tide, but she was beyond the range of the current and in safety.

This and other incidents, however, caused delay in the departure of the expedition on its second journey; but on April 16 a start was made. The party again consisted of Mr. Jackson, Mr. Armitage, and Blomgvist; but was increased by Dr. Reginald Kettlits and Wm. Heyward, who were to travel with Mr. Jackson for a week and then return. With Mr. Jackson were three ponies and six sledges; with Dr. Kettlits, one pony and two sledges. The weather proved exceedingly unfavourable, and, although I will not weary you with monotonous repetitions, the following very condensed account will, at any rate, indicate its character:—

April 16, 17, 18, 19, misty; 20, 21, clear; 22, dense fog and snow; 23, 24, strong E.N.E. gale with dense driving snow; 25, snow and wind; 26, misty till 6 p.m., then clear; 27, clear till noon, then gale from E. and driving snow; 28, strong S.E. gale and heavy snow

—at times wind was of storm-force, and the snow drove furiously; 29, weather moderated towards noon; and 30, calm but thick. May seems to have been very little better, for on the 1st it is thick and misty, with wind from the S.W. until noon, when the wind gets round to the E., increases to a gale, and brings fog and sleet. On May 2 the wind again comes from the S.W., and blows a gale with thick sleet, the temperature, however, rising as high as 34° Fahr. On the 3rd the snow continues to drive, this time from the E. On the 4th a gale makes its appearance from the N.W., accompanied by snow; but at 10 p.m. the weather clears, and the 5th and 6th are actually clear days. The 7th, however, brings a strong gale from the N.N.E. (with snow); and the 8th and 9th, though calm, are misty. The 10th ushers in a strong gale from the S.E., and the snow drives hard; the 11th ditto; and the 12th ditto, except that the wind comes from the N.N.E.

This sample of May weather will interest the geographers who may have studied those maps which depict this area as one of "polar calms."

To return, however, to Mr. Jackson's itinerary. At the entrance to Markham sound and off Dundee point, they passed over thin bay ice, which was even then threatening to break up. Five days later, on April 27, a great crack, 4 feet wide, with standing water, and running miles to the westward across the pack, was encountered, and this was circumvented by making to the eastward; and on the 30th the floe became generally rotten and unreliable, and from that date to the return of the expedition to Elmwood the only difficulty encountered arose from the early break up of the ice. Everything seemed to point to an early season, and the recollection of Payer's experience in the month of April convinced Mr. Jackson that in Markham and Austria sounds the ice ordinarily breaks up early in the year.

Mr. Jackson describes the conditions of travel in the following words:—

"The horses and ourselves suddenly sank into deep morasses of snow and slush, they up to the girths and we above our knees. At the same time there was nothing on the surface to indicate these frequent pitfalls. It was very evident that the ice was breaking up and letting the sea-water in through the cracks, aided by the spring tides. The ponies are quite helpless in boggy slush, and simply lie and flounder, and we had to drag them out by hand and with lines round their necks, and the sledges one by one, while we were wading about in slush above our knees, only to get into similar difficulties again a few yards ahead. I went in front with a long-handled ice-axe, sounding and trying to pick a road; but before long there was no choice, and we had to drag the ponies and sledges through it as best we could. Fortunately, we were three able-bodied individuals and in perfect health, or otherwise we should have looked very foolish."

On May 3, when in lat. 81° 19′ 30″ N., long. 54° 53′ E., after having been camped for two days for the gale and driving snow to moderate, the thermometer rose to 2° degrees above freezing-point. At the same time, there was every indication of open water both to the north-west and the north-east; looms were flying in great number in these directions, and distinct water-skies appeared. Mr. Jackson became anxious about the ponies, as, in the event of the ice breaking up under their feet, there was little chance of his being able to save them. And he had already proved their great value for taking heavy loads over firm ice. So it was determined to retrace their steps while it was possible, and return northward by boat after the departure of the ship.

"As events turned out," writes Mr. Jackson, "we did not start back a moment too soon, and although we frequently marched thirteen and fourteen hours a day, and did not camp even for the worst weather, we had a very close race with time, and only just won with dead-beat ponies. On May 5 the black pony broke through the ice and nearly disappeared. Fortunately, he did not struggle until I had passed the reins round his neck, or he would have gone altogether. Eventually, the three of us managed to haul him out on to the ice. Often we had to drag the six sledges ourselves, having got the ponies through particularly bad places on in front, and going over the same ground twelve and fourteen times. Occasionally we would come to sound ice, and go ahead briskly again; but it did not last long, and the old entertainment of hauling the ponies out of the bog and pulling up the sledges soon began again.

"I at last tried snowshoes (we had left the Norwegian ones at a depôt, owing to their weight) of empty oat-bags, with a little hay in the bottom, tied round the ponies' feet, and this I found helped to keep them up. It gave them a most gouty and ludicrous appearance. But, to cut the yarn short, we did bad luck in the eye, and got them back dead beat, but all right, in the early morning of May 13, having travelled 310 miles."

From another letter to Mr. Harmsworth, I take this passage as referring to the foregoing journey.

"The conclusions I have come to, as a result of our trip, are these: 1. That horses are *the* means of reaching a high latitude from this direction. 2. That sledging can only be done early in the spring, and that horses or ponies should not be out after April 30 (if they are to be used again), owing to the very early break up of the ice here. 3. That only a driving pack will stop our advancing a considerable distance further northward."

What, you will now naturally ask, has Mr. Jackson discovered in Franz Josef Land? and before I reply I must say this. Mr. Jackson has purposely retained his detailed geographical and scientific reports, his maps, his collections. He says that he sends back nothing until next year, in order that everything may be most carefully checked and tested. And that is why I cannot show you to-night any geological, botanical, or other specimens. The only examples of the vegetation of Franz Josef Land which have reached us were contained in a small box of flowers sent by Mr. Jackson to Mrs. Harmsworth. But in the course of his letters he touches upon the geographical character of his line of march, and it is from these notes that I am able to say that he has already done enough to altogether alter our present ideas and maps of Franz Josef Land.

Beginning at the south, then, I may say that Northbrook and Hooker islands appear to be much smaller than hitherto has been supposed, and their coast-lines have been to a large extent altered. The trend of the west coast of Northbrook island, for example, is north-east instead of north; Gunther bay has been much altered in appearance; Nightingale sound is very different, I understand, to what it has been thought to be; and not only does Markham sound undergo considerable modification, but the coast of such land as abuts on it differs entirely from the description given by Payer, who, I should add, only viewed it from a considerable distance. Mr. Jackson has not, it seems, travelled one yard in Payer's track; but as he has actually traversed what Payer only looked at as a distant view, and has, moreover, carefully mapped every mile of his route, we may safely rely upon his conclusions.

But if you will turn to Payer's map—the only one which has ever been made of the interior of Franz Josef Land—you will see that Zichy Land is laid down as a mass of land abutting on the northern side of Markham sound, and extending indefinitely to the north and north-west. He described it as "a vast mountainous region." I believe I am justified in saying that this Zichy Land has no real existence; that where *terra firma* has been placed in that map, there lies the salt sea. Mr. Jackson marched north across that blank space, and marched all the way upon sea-ice. Neither was there sign of any land-mass to the north, west, or east of him. The coast of Zichy Land becomes a group of narrow islands, lying roughly north and south between Mr. Jackson's route and Austria sound. Alexandra Land, too, disappears as a large mass, and becomes a group of islands. In other words, Mr. Jackson has discovered another Austria sound; another channel leading north between groups of islands; another road for sledge-travel, as long as, but only as long as, the ice keeps firm and sound.

Mr. Jackson had reached 80° 36′ 20″ N. and 53° 4′ 37″ E., the northern point of a small island at the northern entrance to Markham sound, on April 26. From this point of view he could see no mainland to the north, and between that and his furthest point (81° 19′ 30″) no mainland was to be seen towards the north. But there was this: two or three small islands away to the north-west, probably Oscar Land; westward, two large distant islands—in other words, as I believe, Alexandra Land; to the north-east several large islands, having bold coast-lines, and rising to some height—that is to say, Zichy Land. Richthofen peak, described in some detail by Payer, who viewed it from Mount Brunn, in the south-east of M'Clintock island, is now, I understand, not to be found in the locality allotted to it. Mr. Jackson camped within a mile of the spot in clear weather, and he states that there is not a mountain to be seen, or anything approaching to one, north, south, east, and west, in that locality.

Once again I repeat that Payer himself has thrown doubt on his own mapping of this portion of Franz Josef Land, owing to the distance from which he surveyed it, and the weather in which his observations were made; but while, in endeavouring to obey our President's wish and give you some account of the geographical results of the Jackson-Harmsworth Expedition, I have drawn on Mr. Jackson's private letters, I would desire to emphasize the fact that he has purposely refrained from sending any map or report until everything has been gone over carefully, checked, tested, and placed beyond all reasonable doubt.

It is in this spirit of careful and scientific accuracy, and with his own natural energy and powers undiminished, that, a day or two after the ship left Franz Josef Land this last July, Mr. Jackson sailed north along leads of open water in the specially rigged and equipped boat, the *Mary Harmsworth*. For the results of this journey, and of the sledge-journey next spring, we must wait until next autumn, when we shall hope to again welcome the *Windward* home, and with her, too, another and even more important budget of news—news of discovery, news of success, and, best of all, news of well-being and good health.*

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* Although no geological specimens have been sent back by Mr. Jackson, a few rocks came back on board the ship, and these Mr. F. W. Rudler, of the Museum of Practical Geology, has most kindly examined. I submit his report:—

"The geological specimens from Franz Josef Land include a large number of pieces of chalcedony and quartz, passing in certain cases into agate, and apparently derived from geodes in basaltic rocks, such as are known to exist in Franz Josef Land. There are also some small pieces of a radiated zeolitic mineral (natrolite), from a similar source, and several masses of crystalline and columnar carbonate of lime, of yellowish-brown colour, like that of sugar-candy. The collection comprises a great number of fragments of argillaceous limestone showing 'cone-in-cone' structure, and some small pieces of septaria. It is notable that one characteristic piece of flint is included in the collection. Such of the specimens as contained fossils were handed over to Mr. G. Sharman and Mr. E. T. Newton for determination.

"The specimens from Franz Josef Land include only a few fossils, and the most conspicuous of these are pieces of silicified wood, which are of considerable size (8 or 10 inches long, and perhaps half as thick), and of a creamy white colour externally, while the inner parts are nearly black; the outer white coating has doubtless been caused by long exposure to the atmosphere. The state of preservation varies in different specimens; in one example (No. 1) the minute structure is perfectly retained, and under the microscope shows most clearly the lines of growth, the medullary rays, and above all the 'clotted tissue' characteristic of coniferous wood. This wood is completely silicified, but the silica is in a very unusual condition, and Mr. J. J. H. Teall, who has examined the section, speaks of it as a *micro-crystalline quartz*, the crystals of which

After the reading of the paper, the following discussion took place:—

The PRESIDENT: We have heard from Mr. Montefiore a very full and interesting account of the procedure of the expedition up to last July, and I think that Mr. Harmsworth, whose great public spirit and munificence are fully appreciated by his countrymen, has every reason to feel satisfied so far. Everything has been done which was intended to be done up to the end of the season, and done well. There appear, with the exception of the unfortunate detention of the ship, to have been no mistakes and no drawbacks. Many interesting questions arise in connection with these proceedings of the expedition. I think Mr. Montefiore has well pointed out that Mr. Leigh Smith was able to place Franz Josef Land in a more favourable light than the Austrian Expedition did, finding a large supply of animal food of various kinds, and also discovering many birds which had not been seen before, and their places of breeding, which was important; and Mr. Grant, I think, in one walk doubled the flora of that vast region. We may, therefore, expect that Mr. Jackson, with more time at his disposal, and traversing a larger area, will add still more extensively to our knowledge. I think it very important that it should have been found that one of the two great land-masses of Franz Josef Land apparently does not exist at all, which entirely alters our ideas of the distribution of land and water. It is an important geographical fact, and I think it is also important for another reason—because we are glad to find that our countrymen, instead of being disheartened by having to follow the track of Payer for 150 miles, can commence with new work and new discoveries almost from the moment that they leave the ship.

There is another point connected with the disappearance of this assumed land, which strikes me as important, and that is, the question of the origin of the great

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show no relation to the structure of the wood, but cut across the cells and are cut across by the woody tissue in an independent and very remarkable manner. Another specimen of the wood (No. 3), which is as completely silicified, but with the cellular structure almost obliterated, has the minute quartz crystals in a somewhat different condition, many of them being more or less radiated.

"Among the specimens are some pieces of a coarse calcareous grit (No. 4), including a large proportion of wood and other plant remains, probably coniferous, but for the most part too much altered to speak of with certainty.

"One fragment of a *Belemnite*, with part of the cone-cavity preserved, serves to indicate the presence of Secondary rocks, but is insufficient to afford any closer idea of its age.

"On a slab of calcareous shale there is the impression of an *Ammonite* with rapidly enlarging whorls, and fine ribs which bifurcate about the middle of the side. This specimen most nearly resembles some of the varieties of *A. macrocephalus*, but there are differences which prevent its being referred to that species; it has apparently been derived from the Middle Oolites, but the close resemblance of some of the Lower Cretaceous *Ammonites* to Upper Jurassic forms raises a doubt as to the age of this Arctic fossil.

"Cretaceous beds with coniferous plants and strata of Oxford clay age have been recognized in Franz Josef Land by Payer (see note by Mr. Arthur Montefiore, *Geographical Journal*, vol. iii., 1894, p. 495)."

The flowers sent home by Mr. Jackson to Mrs. Harmsworth were picked at Cape Flora and put into a box without any special reference to their scientific interest. Mr. G. S. Boulger informs me that they included *Ranunculus nivalis* (the snow-buttercup) and *Saxifraga oppositifolia*, a purple saxifrage. These specimens were in full flower on June 30.

icebergs reported by Payer and Leigh Smith. We must now, I suppose, assume that the glacier of Wilczek Land, 100 miles long, extends very much further to the eastward, and I should almost be inclined to expect another large mass of land towards the north-west. There are many other questions connected with the equipment and the mode of travel, as well as many geographical questions, which are well suited for discussion, although we must remember that the paper is derived from private letters, and is not an official report. I see a good many Arctic officers here, who, I dare say, will be willing to criticize and offer remarks. I see Sir George Nares, Admiral Markham, Captain Beaumont, Captain Parr, Dr. Neale, who went out to Franz Josef Land, and other eminent Arctic officers hiding themselves in distant parts of the room. I wish they would come forward.

Admiral Sir GEORGE NARES: I am sure we are all very much pleased at learning that Mr. Jackson and his party have been landed in the position in which they wished to be landed, and where there is a large field before them for interesting research. We must not, as Mr. Montefiore has shown us, criticize now; we must await the official reports. There are a few points which have been alluded to on which I think I might dwell. First of all, the expedition has undoubtedly fulfilled our experience of the difficulties of reaching Franz Josef Land, which must not be entertained lightly. Instead of voyaging to that region and returning in one season, the ship, as we expected, was not able to do it. I mention this, not to clog further work, but to show that Arctic expeditions, as we advance farther and farther north, require more and more experience and care. I think the captain of the *Windward* deserves great tribute for his successful navigation of the ship to that point and back again. Now, as to Payer's Land. It is all very well for us to correctly lay down land from our ships, but it is more difficult in sledge journeys, with an imperfect knowledge of our surroundings. I may mention that my expedition in '75 was fitted out by Great Britain on the hearsay of, not Captain Hall of the United States Expedition, who preceded us, but what he was supposed to have seen 150 miles to the northward. I think it is very likely that my expedition would never have been sent except for that report. Now, here we have found that Payer's reported land, 50 or 60 miles to the westward, does not exist. I am perfectly certain that Payer's observations were founded upon facts, and when he charted mountainous lands for islands, and called them a continuous land, he must have every allowance. He worked much in the same way as Mr. Jackson, mapping us out the district which he journeys over, within a reasonable distance of his line of route; I dare say he, also like previous sledge travellers, will see in the distance other lands, of which he will give us vague accounts. Mr. Jackson is specially placed in about the most unique position that any explorer could wish to be placed in. Franz Josef Land, up to the present, has been in this position—that the migratory birds journey there three or four weeks earlier than to any other parts of the Arctic Regions, which is a proof positive that there is open water, and, in consequence of the open water, something for them to live upon. There is also seal, and bears feeding upon the seal. To give you the idea of the difference of aspect of such a position, you must remember that where the *Alert* and *Discovery* were, we never saw a bear, because we never saw a seal; we never saw, therefore, any water. Now we are exploring a position not very much farther south, and I hope Mr. Jackson presently will give us a good account of it. Well, in conclusion, I am sure we must all appreciate the position that Mr. Harmsworth jumped into. There was Mr. Jackson willing to go and daring to go, but where were the funds to come from? Mr. Harmsworth has, in a patriotic and generous spirit, which deserves everything we can say of him, come forward. We thank him most heartily, and we also give our tribute to Mr. Montefiore and those who managed the expedition.

Admiral A. H. **Markham**: I had not the most remote intention, when I came into the theatre this evening, of taking part in this discussion, and I now only rise at the express invitation of the President, although I am afraid that I have very little to say that will interest the meeting. I do not think we are yet in a position to criticize the geographical work that Mr. Jackson has already accomplished. I am of opinion that we should reserve our criticism until that happy day when Mr. Jackson returns to us. I have, in common with every one here to-night, listened with a very great deal of interest to the excellent account that Mr. Montefiore has given us of the Harmsworth-Jackson Expedition. Our thoughts have, I am quite sure, been with Mr. Jackson and his brave companions during the long winter that has passed, and I candidly confess that, so far as I am concerned, those thoughts have been tinged with a certain amount of anxiety in consequence of the protracted absence of the little *Windward*, an anxiety that was not relieved until I received a telegram, which Mr. Harmsworth kindly sent to me in Scotland a few weeks ago, announcing her safe arrival in Vardo. From what we have heard to-night, we learn that the members of the expedition have not, on the whole, passed an unpleasant winter, and that the spring and the summer have not been altogether unprofitably spent. I dare say there are some amongst us this evening who would have been more pleased if we could have heard that the explorers had crossed the threshold of the unknown region, and made new discoveries; but if there are, I can only advise them to be patient, for, from what we have heard to-night, we know that Mr. Jackson is advancing in a careful and methodical manner, by laying out his depôts before him in readiness to make an extended journey, which I presume he will do next year; and I am quite sure when, as Sir George Nares just now said, we do get intelligence from Franz Josef Land again, we shall hear of great geographical successes. From what I gather from the paper this evening, the difficulties that I predicted in a paper that I had the honour recently of reading to the International Geographical Congress, have already been encountered by the explorers. I allude to those difficulties attending travel during the summer months, when the snow is of a soft and slushy consistency, and the disruption of the ice has commenced; more especially will these difficulties be found to exist in the vicinity of glaciers and fiords. Mr. Jackson has no doubt realized these difficulties, and will, I am sure, by an early start next spring, and a return again before the summer is too far advanced, overcome them. It is satisfactory to know that there is an abundance of animal food, as we supposed would be the case from Mr. Leigh Smith's expedition, and I attribute to this fact the perfect immunity which the members of the expedition who lived on shore enjoyed from scurvy. I am not sure—perhaps Mr. Montefiore will tell us—whether the crew of the ship lived on board or in huts during the winter. [Mr. **Montefiore**: On board the ship.] I thank Mr. Montefiore for the kindly allusions he has made to me in the opening part of this address, and I sincerely hope and trust Mr. Harmsworth's confidence in my writings will not be forfeited by the results which I hope we shall hear next year of Mr. Jackson's enterprise.

Dr. W. H. **Neale**: I have very little to add, except to congratulate Mr. Harmsworth, and am very glad to have heard that his expedition has done so well where Mr. Leigh Smith and I passed the winter with twenty-five hands just fourteen years ago. We lived in a hut, after losing our ship, on fresh meat, without any lime-juice. Our breakfast was bear and walrus, our dinner was walrus and bear, our tea was bear and walrus for ten months, during which time we had no lime-juice at all, and no sick men amongst the party; and I always say that if I were in the

Arctic Regions again, I would sooner build a hut on the shore, and live there than on the ship. I think that Mr. Jackson's expedition proves that. The crew had more or less signs of scurvy before leaving the land; two succumbed on the voyage home; one died during the winter. I am glad that Mr. Leigh Smith's plans have been followed up, and in a year or two we shall be able to congratulate Mr. Harmsworth on seeing Mr. Jackson return. I don't believe he will do it in one winter, and should not be a bit surprised if he finds he is obliged to give up his present route and work along the edge of the land to the north-west past Cape Lofley. He is getting into a mass of islands and open water, which will give him no end of difficulties, instead of keeping near the edge of the land, which I expect, during the summer, he will find himself obliged to do. I have much pleasure in thanking Mr. Harmsworth for some relics Mr. Jackson has sent home. I have got my old stethoscope and camera, which have been frozen up for thirteen years, and are in perfect condition.

The PRESIDENT: Our gallant countrymen, now in Franz Josef Land, are about to enter on their second winter, I am sure with the same enthusiasm and the same determination to do their work well as when they left these shores. We cannot but all feel very strong sympathy for them, and I only wish that our sympathetic feelings could be conveyed to them as a Christmas greeting, but this is not possible. I am sure, however, that the meeting will desire me very warmly to congratulate Mr. Harmsworth, and to tender your most hearty thanks to Mr. Montefiore for his most interesting paper.

NOTES ON A JOURNEY TO SOME OF THE SOUTH-WESTERN PROVINCES OF SIAM.*

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III.—WEST COAST PEARL FISHERIES.

Pearling in the Mergui archipelago has been carried on for a long time by the Selungs, a primitive people very like the Orang Lauts further south, who cruise about among the islands in their boats, and have no more fixed abode than the snug anchorage they moor in during the south-west monsoon. As a result of their fishing, most of the banks down to 6 fathoms, the deepest to which they dived, have been well cleared of shell. The fishery could only be carried on for one or two hours at low water springs, some five or six days in the month, while for six months during the prevalence of the south-westerly winds all fishing stops, owing to the thickness of the water. The discovery of the Pawe bank in 1891 gave a great stimulus to the fishery, and the output of pearls rose in value to half a lakh. Most of them were small, the larger fetching Rs.50 to 100 in Mergui, and some

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* Paper read at the Royal Geographical Society, January 28, 1895. Map, p. 496. Continued from p. 421.

20,000 mother-of-pearl shells were exported to Penang, valued at Rs.40,000 to 50,000.

The coast-line was subsequently divided into five geographical zones or blocks, and the blocks were put up to auction for a term of three years, with right to collect pearls, pearl shells (or mother-of-pearl) over 6 inches from heel to tip, and bèche de mer.

No. 1 extended from the north end of the district to south of Tavoy Island and Great Canister to Mergui, south of King Island, and north of Merghi, Lloyds, and Chester Islands.

No. 2. South of the above line to Whale Bay, south of Kissairing, Domel, and Maria Islands.

No. 3. Thence down to Forest Strait, and south of Collins and Forbes Islands.

No. 4. To south end of Sullivan Island.

No. 5. South to the St. Andrews group.

Pumps, diving-dresses, and Manilla and Japanese divers were introduced with success, and the first season, November, 1891, to August, 1892, was so successful that a number of pearlers from the North Australian banks visited the fishery, and a dozen of them remained to work on the banks, with the result that there are now sixty pumps at work, of which thirty are in Block No. 3, in which the Pawe bank occurs, and which has so far proved the richer. Small schooner-rigged or native Burmese boats are used for the pumps, and for moving about from place to place, a larger vessel acting as depôt.

The block lease system has given rise to a number of difficult questions, and has not proved very satisfactory in actual practice, and when the present leases are up the Australian plan of a fixed licence per boat and pump will probably be introduced both in Mergui and Tavoy waters, a fee of Rs.500, with a reasonable royalty of about Rs.25 per ton of shells, being probably charged.

Pearling expenses are heavy, as may be seen from the following list:—

Pump from England	£140
Crew pumping, each man per day	Rs.1
Diver, wages per month (advanced)	Rs.42–45
„ per ton of shells	£20
„ food per month about	Rs.25
Tender, all found, and per month	Rs. 70-80

Two dresses last about a season (six months), and four lengths of pipe are in Mergui waters an absolute necessity. Shell last season (1893–1894) averaged £70 per ton, and each boat averaged one ton per month of fourteen days' work, and 520 shells averaged one ton. The real profit is made only on the pearls, and among these in one season very few real gems are found. The best last season were three of 49, 42, and 35 grs., of which the second, being round, was the most valuable, and the smallest, being button-shaped, the next. It has been calculated that a pearl is found to every fifteen pairs of shells, and that the average value is Rs.6 per pearl. Many of them are, however, the so-called "golden pearls," with a yellow amber tint, for which there is no European market, although the Chinese and Burmese prefer them to the white.

Diving with dresses now goes on as deep as 18 to 20 fathoms, but they all say that 22 fathoms in Mergui waters is harder to stand than 25 in North Australian water, and a number of deaths and cases of paralysis due to the excessive air-pressure on the brain have occurred from this depth being exceeded. The sickness comes on with drowsiness after the man has been up some ten minutes or so; sometimes it passes off, but a repetition of a deep dive is always dangerous. It is a rule to take nothing before going down unless it be a cup of tea. The intemperance of the Manilla men helps the sickness, and is one reason why Japanese are preferred. The Burman is much too lazy and too fond of stealing. We met one Siamese diver who delighted in spinning yarns of his under-water adventures, and evidently enjoyed the life immensely.

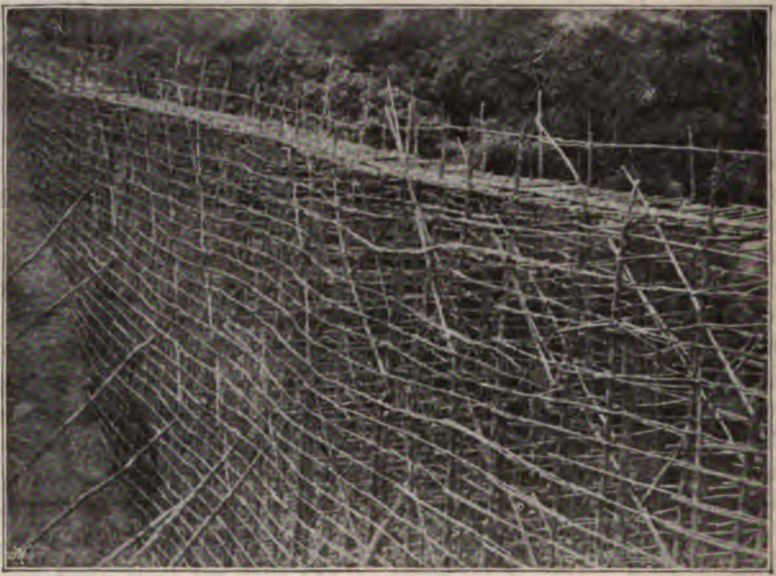
Divers are often accused of opening shell to look for pearls under water, but it is very doubtful if they do so. Delivery of shell has to be taken from the boats at least twice a day, however, for if the shells remain long in the boat, the men put them in the sun until they open, and then run a stick round in search of pearls, the best of which are generally on the rim; they then give the fish a drink of water, and he closes up again. As it is, the divers make plenty of money, and spend it, as a rule, as recklessly as such a class usually does. The pearl oysters (*Avicula* (*meleagrina*) *margaritifera*) are usually packed and piled in sharp rough ridges on the rocks, and lie in places where they get some protection from the stir of the south-west monsoon, always with an island to the westward of them. Another shell, called by the Siamese "sabula," is very thin and transparent, like mica, and grows on mud flats at about the level of low springs. The average life of the former is four years, and when two years old they are in best condition.

The successes on the Mergui banks encouraged search in other parts of the Bay of Bengal, and shell has been found in the Andamans, Cocos, and in Siamese waters in the Kopa inlet. This, however, is the only place on the Siamese coast where a margaritifera has been found, although likely spots abound. There was a small output last year of 3000 pairs of shells, but the pearls have been mostly seed pearls, and of these only fifty were found. The bank is a shallow one, with 6 to 9 fathoms of water. These shallow-bank shells are found to be pitted and patchy and full of holes, the only market for them being among the Chinese.

IV. Tin Provinces on the West Coast.

Puket, or Tongka, as the Chinese call it, which we reached in April, is the chief of the Siamese western provinces, and is almost exclusively inhabited by the Chinese, who are attracted by its tin, and who have settled all over the peninsula wherever tin is to be worked or pepper and pigs can be reared. Their methods of working the alluvial deposits have been so often described, that I shall only refer to the hill workings, to which they resort more and more now, as the gravels and clays of the valleys get worked out. The granite in certain places, more especially where it comes in contact with the red micaceous sandrock generally found lying over it, contains the small black tin crystals disseminated through its mass as one of its essential ingredients. In the north and western Naitu hills rich patches occur, as a rule, close to the junction of the two, especially where the granite sends its veins and strings ramifying through the older rock. These veins are often followed by the miners to some distance, and the gashes in the hillsides which are the result of their work are often 15 fathoms deep, and are visible for miles. The further from the contact, the poorer as a rule will be found the granite. Further east, although the red rock is present, giving to the streams a colour deep as that draining from the Cornish mines of the St. Just district, the best tin is not by any means always found close to the junction, and it often lies in soft quartzose veins running through the harder surrounding granite. The overlying rock is often very much altered near the junction. In places it becomes a grey micaceous schist, in others it is metamorphosed out of recognition; some has been included by and almost transformed into the granite, while a few feet higher up the normal condition of the rock is resumed. When first cut it is often fairly hard, but a season's weathering reduces it to a sticky clay.

There seems to be no great thickness of this capping over the granite, owing to the amount of denudation which has taken place; and, indeed, by this agency it would seem that enormous deposits have been obliterated all through these provinces. In some localities, as above Sitam, there are veins, with a fairly defined foot-wall running through the granite in a north and south direction, with a steep westerly underlie, composed of very kindly looking "gossan," and carrying dark crystals of tin. These veins, however, do not seem "strong," and soon pinch out, while a foot or two away, east or west, another vein will come into existence, and in turn will split up into small strings, or give out in a short distance. The ground is thus very confused; the whole mass is soft, and to a great extent decomposed, with hard zones running through it. The Chinamen work it down with their cross-bars, and knock out the tin leisurely with their hammers, with true Celestial indifference to the flight of time. In working most of these deposits, they show even more than their usual ingenuity and perseverance. Water is collected at suitable heights miles away, and led in leats winding along the hillsides to the points required, and in aqueducts of primitive but efficient construction across the chasms and gullies. At one place, known as Taw Sun, such an aqueduct leads the water, at a height of 65 feet from the floor of the gully, for a length of 200 feet. It is built entirely of hard woods from the jungle around. They are in short pieces, which are spliced together, and lateral stays of giant bamboos are used at the sides. It represents an enormous amount of labour, first in cutting and transporting of the wood, and subsequently in lashing and fitting *in situ;* and every season before the rains it has a thorough overhaul, a gang of men living on the spot some weeks to effect the work.



TAW SUN AQUEDUCT, PUKET.

Walking along these for 6 miles at a time, one goes through dense forest, or among the huge gashes of old workings, now covered with a thick homelike growth of bracken fern. Below, down the hillside, a stream of water will be seen playing on a great white mass of decomposed granite, which is rapidly crumbling before it and the strokes of two or three men, perched like Welsh quarrymen on some insecure footing, and plying their long iron-shod pikes on its face. The stuff as it goes down is carried into a leat, sometimes of wood, sometimes cut in the solid rock for 100 yards, with a gentle gradient in which more men are raking over the running water and helping the tin to settle. Some of these are 10 feet deep, and when it is chock-a-block the water is turned off, and 10 feet of black tin is shovelled out! As may be imagined, the amount of the tailings is enormous. At the mouth of every little stream, where it emerges into the valley below, a wide fan of detritus is deposited, spreading its glistening surface of mica quartz, schorl, and hornblende particles further and wider with every season's work. The finer stuff still goes on down the valleys, and has in twenty years changed the inner harbour at Tongka from a snug port for craft of several hundred tons into a series of shallow banks, which nothing larger than boats can cross, and which extend for a mile out into the bay.

The smelting is mostly done in Tongka, the tin going down by buffalo-carts, and when ready for export to Penang each slab averages a little less than 90 lbs. From these slabs, as they are weighed out at the Customs, one in every six is taken out for the Government royalty—a percentage which, as the tin becomes more difficult of access, is strangling the industry, and will probably ere long have to be altered to a more moderate figure. The total export for 1893-94 was 63,978 slabs, or 42,783 picul (over 2540 tons), which sold for an average price of $34 to $35 a picul in Penang.

The town of Tongka literally smells of tin. Who that has visited Cornwall and its tin-mines does not know that unmistakable air which comes off granite, and especially decomposed granite, rocks, or off the dressing-floors of a tin stream work? It greets you when you land at Tongka, at Renong, at Takuapa, at Ponga, or at Maliwun; but any visions which arise in the mind of a colder clime are quickly dispelled by the tall groves of cocoanut palms which flourish on the heaps, or, less pleasant, by the vicious charge of a loose buffalo. Circumstances kept us among these sights on and off for the best part of a month, and I often wondered what an inspector of mines at home would say to see the Chinamen working pits 30 feet deep under the roads, or engaged in breaking heads over some question of water-rights.

In the province of Gerbi (or Bi, as it is locally known) areas have been taken up for the purpose of exploiting the outcrops of lignite which occur in several places, and in our visits to these localities we had opportunities of seeing something of the wonderful series of inland waterways, which extend from the Muang, or township of Gerbi, on the north, right away to Trang, and beyond, on the south. The whole coast-line inside the outer islands consists of mangrove swamps. Here and there a low hill rises above the rest, and at its foot a Malay village lies, and the people come off in their long canoes, arrayed in sarong and kriss, to pilot you to your destination, or have a yarn and some tobacco. The mouths of the rivers are often flanked by spotless stretches of sand, where the wind sighs through the Casuarinas, which love to cluster near the foam of the surf, and add their gentle moan to its dull roar. What struck one most, coming from Siamese scenery, were the open spaces upon the hillsides covered only with Lallang grass, and otherwise open to the sky—the remains of the industry of former times. Similar in their effect are the bleak cliffs of the westernmost points of Junk Ceylon Island and the coast northward, swept by the driving gales of the monsoon, bare of vegetation, and backed by a stunted growth of gnarled underwood—so natural and homelike to the northern eye.

To reach Trang, we went along the coast outside in preference to the intricate inland waterways, and met a fine western sea rolling in on the beam. The monsoon had burst with a gale of wind, which kept our little craft riding for a couple of days in Paklao river, with two anchors and 15-fathom chain ahead, and it had now hardened down into a topgallant breeze. We got into Trang river at night, but, with the aid of the marks lately put down by the Rajah, we were able to go right up, with the long musical Malay calls of the leadsman echoing back to us off the trees. Trang's great industry is pepper, of which it exports some 60,000 picul a year, at a value of some $485,600; and Palean to the south, which is also under the Rajah of Trang, exports about 3700 picul. But the growers are complaining bitterly of the present poor prices, and find that with pepper at $8 a picul instead of $25, with roads to maintain, and a royalty of $0.60 a picul, profits are looking small, and labour has been reduced one-half on all estates. There are now only some 10,000 Chinese in the Tapting district. This means a large coolie emigration, which takes place chiefly to Perak and other protected states, where every form of inducement is held out to industrious immigrants, and the proximity of which is a menace to the future prosperity of Trang, Puket, and all the western Siamese provinces, where Chinese labour has been the developing power. What they want still is population, and the state that holds out the most liberal inducements will go ahead. That the Chinese coolie is tolerated anywhere, and even sought after, shows how the money-making spirit will distort men's notions. I confess to great sympathy

IN GERBI BAY.

with that quiet gentleman, the Malay, who sees his fair lands invaded by hordes of these pork-breeding barbarians.

The Trang exports include 6000 to 7000 squealing pigs, 70 to 80 tons of tin, and some 3,132,000 attaps, which are made all down this coast from the dunny palm for roofing purposes, and largely sold in Puket, Penang, etc. They pile them high in the small junks, till they look like hay-barges on the Thames. The Rajah, Phya Rasadah, who is well known in the straits for his enlightened views, is striving hard, by making roads, instituting police-courts, and introducing something akin to the village system he has seen working so successfully in Burma, to fight the counter-attractions which are held out by the protected states to the southward of him. He did a bold thing two years ago in moving his capital from the old town of Kontani, down river to Kantan, a spot within a few miles of the sea, a healthy site on some hillsides, where the river is wide, with over 2 fathoms at low water springs. He is there building offices, sinking wells, and opening roads and canals vigorously. There is good paddy land about, and this he is getting cleared and drained. A main road is being run through to Kontani to connect with the pepper district round Tapting, and the tin-mines inland. As a reserve, he is encouraging the planting of nutmeg by twenty and thirty trees at a time in the plantations, and there are now some 10,000 trees in the ground. They take six years to bear, and then, as things now are, give an average profit of $20 a year each. If he can continue this policy, Trang will yet vie in material prosperity with its southern rivals. The country is not lacking in all that is counted wealth in Malaya, and it has more than its share of fertile plain-land. As the map shows, the great axial range is at this point much less important, and its lateral spurs are insignificant.

It was our fortune early in May to begin our return journey, by way of Ponga, in the top of Junk Ceylon bight, very heavy weather preventing our going to Takuapa, for which we were bound, by sea. The people here are essentially Siamese, there being much less of the Malay or Chinese elements; but they still have the nasal accent, which is noticeable in the Siamese-speaking people of the peninsula, and which reminds one of nothing so much as what is termed the Yankee twang. Our eyes were again gladdened by the yellow Buddhist robes and the gleam-points of the white prachadees (or pagodas), and Master Cheerful's spirits rose as he contemplated the beautiful black teeth of the damsels, which I, poor Philistine, was apt to consider atrociously hideous.

The uniqueness of Ponga depends upon its limestone peaks, which form the characteristic of the northern end of the bight, and stand in sharp points and steep precipices out of its waters, some more than 1500 feet in height. They have a perceptible dip to the southward off the sharp granite ridge of the Khao Dau Mawk Lek range, which forms the frontier between Ponga and Takuapa. Beneath them nestles the little town, its homesteads scattered among the areca palms, the elephants musing among the bamboo shoots. Above, while we were there, roared the south-westerly gale about their summits, and the wild whisps of low cloud clung upon their shoulders. The Rajah, who is now an invalid, has been long known as a courteous and efficient ruler in his little state, which, quite cut off from the outside world, enjoys a certain wealth in elephants, rice, betal, and attap, and has an air of peaceful prosperity and content. The trail across to Takuapa goes up the Ponga river almost to its source in the northern granite range already mentioned. A few small hill workings contribute some ten tons of tin a year, and an enormous quantity of tailings, which have played havoc with the stream.

THE ENTRANCE, PONGA RIVER.

The first night we stopped our elephants at Ka Ngawk, a dirty Chinese village, and next day, crossing the hills, we descended by a rough trail among huge granite boulders and old tin-workings to Kapong, a dirtier Chinese village. This is fairly in the province of Takuapa, and did not impress us favourably. There was no monastery near by and no sala to stay in. The house in which we were accommodated was one of the usual mud-floored, low-walled erections in which the Chinamen usually store themselves and their pigs. Some of us were fain to sleep in the roof, but even there did not evade the smells; those below had to contend, *inter alia*, with the advancing water of the neighbouring stream.

The Siamese style of building on piles is without doubt far more cleanly and efficient for these countries, and the large raised floor outside the houses gives dry resting-place for men and baggage in the highest flood. A Chinese street, too, choked with every man's and his neighbours' offal, is absolutely impassable in rainy weather. The Siamese, on the other hand, live scattered among their gardens, and if the ground is underwater, it is at least navigable, and the canoe is not in danger of running on the sunken shoals of the neighbours' ever-increasing dust-heaps.

From Kapong we reached Takuapa in dug-outs next evening. The river is a mere stream, but, being in flood, the boats could float. The forest is very dense all the way. The tin nearly all goes down into the town on elephants, often 30 or 40 miles on very rough tracks. Next to Puket, Takuapa is the largest tin-producer along the coast, but its total does not much exceed 600 to 700 tons a year.

The mines are known under three separate heads:—Mueng Karar, worked for six months in the year, being dependent on the rains for water; usually small, with only two, four, or six men. Mueng Len, hill open cast workings, not dependent on the rains, where washing is done every fifteen days or so, as sufficient stuff is cut down. Mueng Karsa, the usual large open workings in the alluvial, where the washing is done from day to day, and large numbers of men are employed. Water-sources and waterways, rights of way, and boundaries are in a grand state of confusion for the most part, and claims and counter-claims result in lengthy and unsatisfactory lawsuits, of which the most tangible result is generally a row and some broken limbs.

At the town the tin is smelted, stamped, and weighed, and the royalty deducted ready for the monthly steamer. It then goes down to the estuary where the steamer lies, in long badly shaped boats, which carry one big China lug. In the floods they are often two days returning to the town, a distance of some 14 miles.

We witnessed a remarkable sight one evening in the estuary—hundreds of huge bats (Pteropus) passing overhead for some twenty minutes, going east towards the gardens of Takuapa for their nightly raids upon the fruit. They flew very high, apparently 600 feet up, and very slow; and were scattered at intervals of some hundred yards all over the sky as far as the eye could see. They evidently came from the outlying hills on the coast-line.

The estuary has a lot of sandbanks and sunken rocks which are unmarked, and make an awkward place for strange craft; the southern entrance has only two fathoms on it, and is flanked by long banks extending many miles out to sea. The strong tides and heavy sea always running on these banks, the roar of which will travel 6 miles up the estuary, together with the absence of well-defined landmarks or buoys, make it a dangerous entrance at best. Its only advantage is to save three hours' steaming for vessels bound in from the southward, which would else go round by Kopa Head on the north. A clearing has been made, and machinery is out for a lighthouse on that head, and it will be a great advantage to the port.

It is curious how comparatively few craft one sees along this west coast even in fine weather. A few Penang junks, whose remarkable feature is the clumsiness of the sterns, some two-masted Burman boats, an occasional double-tailed sampan, with her foremast raking like a bowsprit, or an Orang Laut boat, with her horizontally seamed dipping lug. The sail of these boats is of matting, as usual, the tack brought to the weather-bow, and the luff set taut by a spar from the deck set in a cringle halfway up. The mast is strongly stayed on the weather side. I was astonished at their weatherly qualities, and, close hauled, they will make an exhibition of an average ship's boat. The hull is similar to that of the Selungs of the Mergui Archipelago, the gunwale and topsides being of neatly lashed cane.

MORNING: KOPA ESTUARY.

SAMPANS.

Nearly the whole of the rice of Takuapa is imported, there being only sufficient grown for the Siamese population. When we arrived, both rice and opium were running short, as the steamer due from Rangoon with large consignments of these necessaries had been lost off the Moscoes in the recent heavy weather. The consternation among the Chinese Towkays, when we brought this news, was great, for the Chinese miner without his rice or opium is inclined to clamour. Messages were sent overland to Puket to represent the state of things, and meanwhile a series of gales set in which kept us prisoners.

The elephants I had ordered in for the march to Renong were unable to reach the town, owing to the swollen state of the streams, and at the end of a sufficiently dull week a few arrived, staggering like drunken men through the current of the river. While waiting for their brethren, they played havoc among the gardens, and we were besieged by irate husbandmen and their wives crying for compensation. I set Master Cheerful to tell them stories, and Master Star was turned on to warble his falsetto trills, which, though they used to make me only irritable, seemed to have a calming effect on them. We were thus able to send them away softened and appeased, with a tical or two as a price for our elephants' dinners. The elephants were brought in by their mahouts for punishment, and though they looked, on their arrival, highly satisfied with themselves, after being two hours tied up standing absolutely still, they became penitent enough.

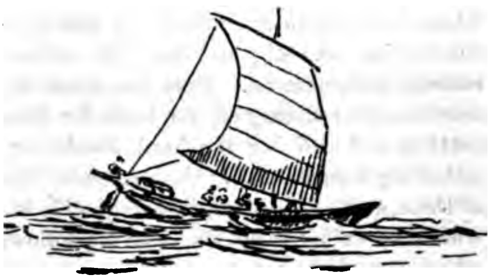


FIG. 1.

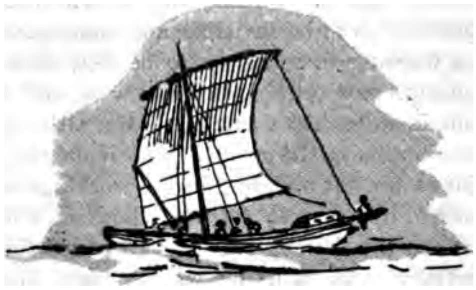


FIG. 2.

ORANG LAUT BOAT (FIG. 1) FROM LEE SIDE, (FIG. 2) AND WEATHER SIDE.

There was one dry space in the vicinity of the town on the small pagoda hill overlooking the turbid yellow river. Here the boys of the place played a game exactly akin to our "hide and seek" all the time it didn't rain—the first time I have seen the Siamese youth so exert himself. In the evenings we had concerts, which were well attended by our neighbours, our orchestra consisting of two accordions, a picolo, a tin pot and two sticks, and we gave an enthusiastic betel-chewing audience selections from the Siamese Ma Yong, Soi Son, and Plaeng Lo, and some English songs like "Nancy Lee;" the chief advantage of the Siamese airs being that they can go on without ever stopping, thus providing that monotony dear to the Eastern heart. Our only interruptions were the occasional removal of part of our roof by the gale, and the inrush of the waters. The weather moderating and a steamer calling in, we were able to accomplish the journey to Renong in ten hours instead of ten days, which we should have taken going overland.

The alluvial tin of this province has been almost entirely worked out, and the mining is now all going on in the hills, up the lovely granite gorge through which the Hat Sompen stream has cut its way, and is centred round the village of that name about 7½ miles from Renong. The valley is here wide and open, the stream a wide sandy track of tailings, and the hillsides are gashed and dyked just as in Tongka. These hill-miners are miners in the true sense of the term—unlike the coolies, who dig and carry the alluvial as if they were making a railway embankment. Here the miner is a skilled hand at hollowing a tree-trunk, or slicing off the bark for his water-launders; in selecting, cutting, and splicing the hard woods for his aqueduct, or cutting his mile-long trenches along the contour of the hills—which are alone, many of them, quite feats of engineering. He knows wolfram and hornblende, which he calls "dead tin," and he follows with unerring scent the tin which "un do knaw sure noff."

The granite is peculiarly white, soft, and decomposed, and the tin runs all through it. Unlike what I saw in Puket, it is often in such fine particles as to be invisible, and some places looking quite poor proved, on washing in a dugong, to be rich in tin. Some large hard veins of quartz I saw running east and west, and dipping about 60° south, were unmineralized, and carried no tin, although there was often a rich dissemination in the granite in their neighbourhood. Some of the granite pinnacles left standing in the workings some 200 feet above the stream looked like grotesque ruins. Looking down from them upon the valley where the driving rain-mists blurred the outlines, one saw the sloping cottage roofs, winding watercourses, piles of tailings, timber, sluices, and water-gates, with a few men moving industriously about, stirring with the chonkuls in the boxes, strengthening weak banks, plying their crowbars on the rock faces, and generally helping the thundering streams, and making the most of the rain-time, which, if bad for fevers and the like, is yet, say they, "good for tin." On all, the red and yellow stains contrast with the heavy green of the surrounding forest, climbing far into the clouds upon the western hills.

The mines are worked on a licence system introduced by the late Rajah, the average size of a grant being 10 olong (1 olong = 1⅓ acre). The licence lasts a year; trespassers on a particular "kongsie" (whose name is always written up on the coolie houses, or somewhere on the "sett") are subject to fines, and all complaints go before the Rajah. Water sources and rights are defined on the grants, and order is consequently preserved. The smelting is done in Renong principally by the Rajah. The charcoal is all made in the surrounding country, licences being granted for felling the necessary timber. The furnaces are of the usual clay pattern, and smelt 280 bags of 20 to 22 catties each in three days and four nights; six men working change at the bellows, with two overmen, who superintend the charging, tapping, etc. The slag is usually recharged four times, and then stamped fine in a small battery of four heads and treated once more. Renong is famed for its roads and the hospitality of the Rajah, who is the brother of Phya Rasadah, and not behind him in clear-sightedness.

On our way up the Pakchan I had subsequently an opportunity of seeing with Messrs. Kenny and Clunis, who were at the British station at Victoria Point, some of the remarkable lodes of the Maliwun district on the west. The tin occurs in light grey crystals often 1½ inch long, in well-defined and highly mineralized east and west lodes, and is quite different to anything I had seen on the coast. It struck me as a grand country, but the population is astonishingly small, and it seems a century behind the Siamese side. From here to the Lenya river and to Tenasserim extend nothing but dense forests full of elephant, rhino, pig, buffalo, tiger, and deer, but hardly a trace of man. We found the people all along the Pakchan river suffering from an epidemic of dysentery, which the continuous chilly rains no doubt aided, and which they seemed to have no ideas of combating. The old Muang Kra is now more generally known as Pakchan (Pæchan, "the forest of sandalwood," and *not* Pakchan, "the mouth of the trap," as has been suggested), and the valley is a pretty little paddy-growing plain—in decent weather.

V. Up the East Coast.

We all showed signs of sickness when we left Kra for Chumpon with ten elephants, four of them accompanied by their babies. It is an easy march, and has often been described and visited by persons interested in the canal scheme. There is tin lying in the main range away to the northward, but it has been but little worked. We slept at Tarsarn, and next night at the governor's house at Chumpon, and it was curious to find ourselves under an almost cloudless sky, with a dry air about us, and a baking soil beneath, and the change from the damp of the west coast to the warmer temperature soon set us up again. It was still blowing hard, but the climate was a different one, while not 20 miles away to the westward we saw the heavy clouds lying low upon the watershed. This phenomenon is seen all down the peninsula, and the rains may be on with all their force on the west while the east is still athirst.

The training of the elephants struck us as being here more superficial than in most parts of Siam, and we witnessed some wonderful differences of opinion between elephants and their masters. One of ours made off in the night; he was followed up next morning by two men, and when we were on the march later in the day we met him being brought in by them. One sat in the usual place upon the neck, the other just behind; and as he rushed and plunged wildly about, they clung to him with knees and toes, belabouring him with their sharp-pointed spikes till he was covered with blood. He was a huge beast, but he had to give in, and the men seemed glued to him. The babies, as usual, were most amusing, and led my dog Rover a terrible life. Whenever he was helpless, swimming to cross some deep pool, they would rush upon him, and how he escaped being killed was a mystery to himself as well as us. Along the trail any elephant he approached would kick out sharply, swing the bristles of his tail on to his head, or make a shot at him with the end of his trunk. On the whole, Rover, who is particularly fond of stalking, and playing the tiger with a herd of buffaloes, found elephants less amusing.

The Chumpon plain is typical of Siam, with the gaunt sugar-palms along the streams, the large herds of cattle and tracts of paddy-land. The people, too, have much less accent, and in their houses, boats, and appearance conform to regular Siamese custom. We took up our quarters in the large Chinese and Siamese fishing village at the mouth of the river, expecting daily that a steamer would be in to call for us. A number of fine junks were lying in the roads outside the bar. There is no greater mistake than to talk of these craft as "crazy little vessels of cumbrous, antiquated shape, mat sails, and decayed rigging." On the contrary, the moment they are in port the running rigging is all unrove and stowed away, the sails are carefully covered up. When hoisted, they generally show a shape and flatness of set, which makes them the patterns for ship-boats' sails all over the East. Their varnished hulls and smart little touches of paint vie with those of the famed Thames barges. As it was the height of the "pla too" fishing season, the bay was alive with craft.

The village is entirely devoted to fishing. All along the river are high bamboo stages for fish-curing, net-drying, and fish-trap plaiting, these operations being carried on principally by the women while their husbands are afloat or taking a watch below. The place smells strong, but what matter when you are living on fresh fried pla too, calamary, oysters, eggs, bananas, pineapples, and mangosteens? In every way the contrast to the other coast was delightful; for there is no doubt that one can have quite enough of uninhabited country, and that in reality no scenery can be complete without some trace of the child of man upon its face.

The coast trade is somewhat extensive. Large quantities of fish are salted and sent to Bangkok, Kalantan, and Singapore. At Bangkok they pay import duty of one salung (¼ tical) per picul, and prices vary from three salung to five ticals a picul, according to the time of year. June and July are the months in which, finding smoother water, the fish, like the vessels navigating the gulf, approach the western shores to windward. In the north-east monsoon, on the contrary, the fish harvest and the navigation all goes on on the north and eastern coasts under the lee of the land. Edible birds' nests from the steep islands of the coast are also a considerable article of export to Bangkok; the islands are farmed by the Governor of Chaya. Rattans and jungle produce, horns and skins, all add to the local trade.

After a few days' waiting and finding no steam craft turn up, I arranged with a young Siamese, who owned a "rua pet," to take us to Bangkok. He was bound to Pechaburi with rattans; and his crew consisted of a crumpled, weather-worn old Lukchin [*] as sailing master, two quiet Siamese as ordinary seamen, and a young brother known as Dek, or the boy. With our party of eleven there was not much room left. The boat was 36 feet long with 11 feet beam and 6 feet depth; being light, she was drawing not quite 3 feet. She carried the two high-peaked lug-sails common to these craft, the mainsail having three to five times the area of the foresail, both of matting. I confess, when we bent the sail on to the long mainyard, I wondered how any thing of such transparency and loose texture could take us up the gulf, and even be relied on to reach to windward in a big sea if necessary. The type of craft to which she belonged (rua pet, not to be confounded with the rua pets of the inland waterways) is a healthy type common to the Siamese of the coast. They are double-ended, and with great beam carried well aft; the floor is rockered up fore and aft, and flat enough to ensure their sitting up when ashore. There is not a nail in their construction, all being wood-pegged; the best of them are invariably built of "mai takien" in preference to teak, and will last thirty years' knocking about without substantial repair. Such a boat, 50 feet long, 15 feet beam, and 7 feet deep, will cost new about $900. There is no keel, and the rudder is shipped on a spindle aft on the round stern. The masts have a great rake aft, and the yard is peaked by a separate peak halyard, and a downhaul at the fore end. They would be

CHUMPON FISHING VILLAGE, FROM THE RIVER.

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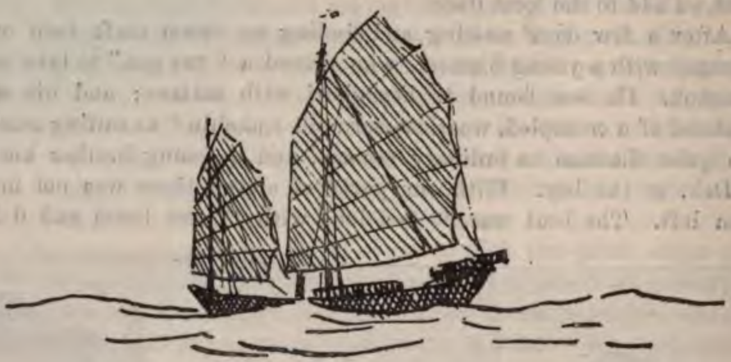
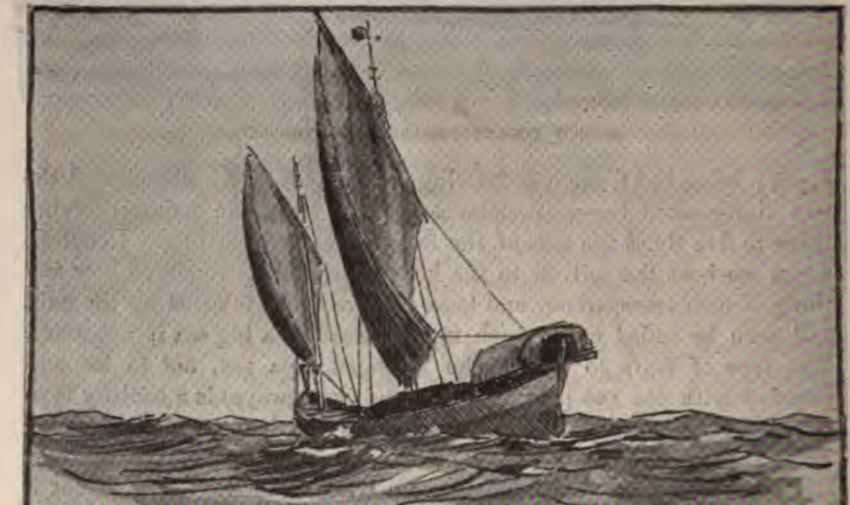
[*] Lukchin, name applied to sons of Chinamen by Siamese mothers. They generally have the good qualities of both races.

much handier for a tackle on main halyard and sheet, and at present the chief difficulty in handling one is the want of such contrivances. To hoist the yard up, four men have to swing their whole weight on; and the only way of getting the sheet in is to luff and take the strain quite off. Reefing is done by rolling the sail up round and round the boom as the yard is lowered, and in furling the whole sail is rolled up in this





LOCAL TRADERS IN THE GULF.

manner to the yard until it looks like a lateen. The yard is controlled by a brace to the stern-post, which is usually kept pretty taut even when free. It is true this furl gets the sail out of the way, but the weight aloft makes them roll at anchor, and a strong squall getting them on the beam has been known to capsize them when light. The foresail is seldom trimmed much, or reefed; it is more a steering sail.

The boats bear a very heavy weather-helm, and have to be trimmed very much by the stern. Rayong and Chantabun on the East are the great birth-places of these boats.

The sea-going Chinese and Lukchins of the gulf usually prefer a type of longer, narrower, and much shallower craft known as rua chalom, which are easily distinguishable by their high peaked stern and stern-post. The larger trading craft carry the two lug-sail rig already referred to, though sometimes they use the battened China lugs. The small fishing craft, on the other hand, adopt one big standing lug, cut square-headed like a coble's, and set on a mast stepped amidships, and raked well aft. Their main peculiarity is the two rudders shipped one on each quarter; the helmsman uses the one on the lee side, though before the wind he often uses both. When down they draw several feet more than the boat, and when up one may often be seen set up on end to act as a mizen and keep the boat's head to sea. As far as my experience goes, this type, having less hold in the water than the rua pet, and being even rounder in the bottom, is, size for size, less efficient to windward, and a one-rater of my own which has no chance with them off the wind, has, beating to windward in a moderate sea, put them 4 to 5 miles under her lee in a few hours. In most of them there is a plaited "kadjang," or shelter amidships, and some of the big rua chaloms have a quaint little steering-house up aft.

It is curious to note the small local peculiarities of the different sea-side places in their boats and fittings, so well adapted to their own localities. Their smartness in handling, and their appreciation of the qualities of their craft, make the seafaring class of the gulf one of which any coast might be proud. In their language, their ways, and the nameless something there is always about seamen, they are very distinct from the shore-going Siamese. They are hardy, eat little and simply, and face all weathers in a pair of short loose white or blue trousers coming halfway down the thigh; they are as much at home in the water as out, and their hard skins seem impervious, and glisten like an oilskin coat. I have seen a man spring overboard in a heavy sea on a lee shore to pick up the tiller, which got unshipped and washed away, and then swim away with it dead to windward, fetching the boat as she came by on the other tack—a feat which called for nerve and judgment of no ordinary kind.

Their names for the winds do not go, I may here remark, according to the points of the compass, except in the case of due east or west winds, which are comparatively rare.

Eng. Point.	Siam. Point.	Wind.
N.	Nua.	Lom Wow.
N.E.	Nua Tawan ok	„ Ut Kra.
E.	Tawan ok (sunrise).	„ Tawan ok.
S.E.	Tai Tawan ok.	„ Hua Kao.

Eng Point.	Siam. Point.	Wind.
S.	Tai.	Lom Tapow.
S.W.	Tai Fawan tok.	„ Salartan.
W.	Tawan tok (sunset).	„ Tawantok.
N.W.	Nua Tawan tok.	„ Yego.

A squall is known as Lom Fon, or the rain-wind.

We hove up at evening on June 12, to get the night flood up the coast, and by morning were off the limestone bluff of Lem Chong Pra, the wind freshening merrily on our quarter. We passed during the day a number of rua pets beating down the coast, like ourselves with mainsail reefed, making lovely pictures as they plunged through the head sea. At sunset Kao Luang lay abeam, lost in clouds and rain, and we had another reef down. Wind S.W. 5. A number of large open grass spaces visible to-day along the hills.

The morning came calm, and we rolled about off Muang Kuwi, to the discomfiture of the cooking operations. The Siamese say eating something nice brings wind. It is questionable how far half-done curry and quarter-boiled tea is nice; but the wind certainly came up in the middle of breakfast and lay us down to a pretty angle, and sent us roaring up past the shoal-water patch and the fishing-stakes below Sam roiyat. We passed lovely little villages clustered in sandy bays, and lots of rua pla (small four-oared rua chaloms) out fishing at their stakes, or going up deeply laden to their villages. The time was enlivened by the yarns of Dek, who talked and chaffed incessantly when his elder brother and the Luk Chin were having a caulk after their watch. He was a lusty specimen of the well-to-do Siamese; he wore a clean, tidy panung and white jacket, which he did not disdain to disregard when a reef had to be taken down or the yard set up; he was one of those people to whom everything healthy comes as enjoyment, and his conversation was less coarse than is often the case with the more idle of his class. His elder brother was one of nature's gentlemen—a quiet, refined, and thoughtful-looking fellow, with the manners of a courtier and the heart of a sailor.

Passing Muang Pran, with a breaking sea running astern, we were off Chulai Peak before sunset; and from here our sailing master hauled off the shore, and headed away for the bar of the Meinam river. He brought up his prayer-papers with great solemnity, and, selecting a couple, lit them on the lee gunwale and hove them overboard, and a joss-stick was put burning on the stem-head. The only apparent result of this was the collection of a heavy bank of clouds in the north-west, which covered the sky very fast, and, as the sun set, rushed over the moon. We reefed down in the darkness and got supper stowed, and soon after the south-west wind was dead, and the water darkened in the north-west. The clouds aloft suddenly ceased tearing across the sky, and then the lower current of wind came sweeping down. All night we flung close hauled through a short, rough sea, the men crouched to windward, and the spray flying far alee. Next morning we were 5 miles off the Tachin river in a roaring calm, with sixteen men and one dog bursting their lungs with whistling. I had a bathe, to the great horror of the Siamese, who all exclaimed, "Why, it's salt!" I told them how in Europe people travel hundreds of miles (by train, not on elephants) to bathe in this same salt water, and they classed this with the yarns of the sailing master, which were prodigious.

The western hills lay far astern, and on the eastern horizon, beneath the round red sun, lay the Bangplasoi mountain. To the northward, suspended in the heavens, lay groups of trees and boats' sails, and far beyond the smoke of the rice-mills of Bangkok. By three o'clock, with a roaring flood and a smart south-west breeze, we were in Paknam, and that night we bade farewell to our shipmates. There is nothing like the sea for bringing men together, and making good-byes loth.

Our return to Bangkok was the signal for every one of the men who went with me to get laid up with fever; they did it with a promptitude and unanimity which exceeded what they had ever before shown. However, one or two were really very ill, and have now been so for months. Bangkok seems to have a way of its own in this respect, and successfully invalids hundreds of men who have gone through long jungle marches without any sickness. What the cause is it would be hard to say, especially as it generally happens within a day or two of the return.

Before the reading of the paper, the PRESIDENT said: The meeting will remember that a year ago we had a very interesting and very able paper from Mr. Warington Smyth, describing his journey to the sapphire mines on the northern frontier of Siam, and his return by the Mekong valley. The paper was considered so important that the Council resolved it should be published separately as a volume, and with capital drawings to illustrate it. The volume is now ready, and I would urge upon Fellows, as many as possible, to send for it, for I am sure they will be well repaid. It is a most interesting little volume; moreover, the experiment of publishing has not yet been settled, and it will rather depend on the success of this first undertaking whether the Council of the Society will be able to make it the first volume of a series, or only an exceptional publication.

We are assembled this evening to hear a second paper from the same author, Mr. Warington Smyth, which I think you will find equally interesting. It is a journey from Bangkok to Tenasserim and down the river; afterwards he visited the Mergui pearl fisheries and tin workings of the Kra Isthmus, and other points of great general and geographical interest. I regret very much that he is not present this evening, for he is still doing useful work at Bangkok; but I am glad to say his friend Mr. Probyn will again, as he did last year, have the kindness to read Mr. Warington Smyth's paper.

After the paper was read, the following discussion took place:—

The PRESIDENT: I regret very much that Mr. Curzon is unable to be present this evening. I have seen him this afternoon, and am happy to be able to tell you that our Vice-President has returned from his perilous and most interesting journey, looking as well as he did when he started, and that he has promised to give us a paper that must certainly prove extremely interesting on the subject of the sources of the Oxus. Mr. Warington Smyth, in his paper, alluded to the forests, especially to the trees yielding the dammar oil, and referred to some of the forest rules, such as that which disables people from building their canoes because of the tax on the felling of timber. I see present to-night Sir Dietrich Brandis, to whom England owes so much as the organizer of our Indian Forest Department. I am very glad to see my old friend again, and cannot refrain from expressing a hope that he will address us on the subject of the forests of Tenasserim, more especially as there are few people in the world who are so intimately acquainted with that country as he is.

Sir Dietrich Brandis: I am extremely obliged for the kind invitation to speak about the forests of this country. I should like to do so, but it would take longer than the patience of the ladies and gentlemen assembled here could possibly permit. The paper we have had the pleasure of listening to to-night, with its excellent illustrations, has carried me back to the time, many years ago, when I had the great privilege and pleasure, for which I can never be grateful enough, of serving my first seven years in Burma under a man whose name is far too little known in Great Britain, an Irishman, a good man and a great man, Sir Arthur Phayre. I mention the name because, in this paper, we heard that Mr. Smyth, when he approached British territory going from Siam, at first met with things that did not please him—a wild feverish country, the Tenasserim river not used commercially, for trade or communication, only one boat, one canoe, while he met with complaints from the Karens. He found them complaining that they were not allowed to cut the large trees growing about, in order to make canoes. I do not know what forest rules have been introduced since my time; there may have been some ill-advised arrangement—that is quite possible. It is also possible that the country along the Tenasserim river was not inhabited, and that the Karens in reality did not care to make any boats, as it is very feverish about there. I was pleased that when he came into the vicinity of Tavoy, he spoke with satisfaction of the roads and rest-houses which, under British Government, have sprung up; for too little appreciation is shown of that part of British India, formerly the kingdom of Burma. I had the privilege of commencing my service in Pegu early in 1856, only three years after its annexation, and I saw how, through the wisdom and the determination of Sir Arthur Phayre, that country was converted from one of the most unruly and wild into a flourishing and well-peopled country. In 1860 I was on the banks of the River Sitang, and opposite was a large crowd of people I did not expect to see. I went across in a boat, and found myself in the midst of ten thousand Shans; they had crossed the frontier. I made the acquaintance of the Sabwa, and we became great friends. I was able to help him, as he had no money left; in fact, I was able to buy a pony from him. They had fled from their homes, fields, and possessions, because they could not stand the oppression of the Burmese governors. A few years afterwards I saw them again; they had built a large city on the Sitang river. That is how Sir Arthur Phayre managed to populate the country. The population of Pegu rose from 700,000 in 1856 to 2,300,000 in 1881. I was glad to see the results of British rule in the southern part of Burma, and it has pleased me much to see that Mr. Smyth speaks with some satisfaction of the Karens. Now, that is another point on which far too little is known; it is hardly known that the Karens are probably the most loyal subjects Her Majesty possesses in the British Empire, outside England and Scotland. That is a matter of importance, and among the Karens Christianity has made great progress. You may say half the nation are Christians now, and it was a pleasure on my first journey, after spending several days in the wilds, meeting hardly anybody, in the evening to hear at a distance the sound of the song of praise which they sing in their chapel; and it was a pleasure to see the schools, in which the Karen boys were squatting down in large numbers, men, even a few with white hair among them, trying to learn as fast as the boys. Later a bold attempt was made among the Karens, not only to teach the boys, but to teach the girls, which was much more difficult. I was present when a very enthusiastic missionary lady had an assembly of the headmen (Tsokays) to meet her, and said to them, "You teach your boys nearly as well as the Burmese boys are taught in their monasteries." (This was about 1856, and at that time it was rare to find a Burman who could not read or write; and if I did find such a man he was miserable, and said, "It was my misfortune to grow up in a jungle village; we did have a pongee, but the water was bad and the air was bad, so he left; we could not keep him.") "Now you must educate your girls, or the boys will never look at them; they will go somewhere else to marry." These Tsokays, who were great friends of mine, were very shrewd, and answered, shaking their heads, "Mama," as they called the lady, "it won't do. These girls of ours are far too clever already, and if we make schools for them, if we teach them in addition to their cleverness, we shall be nowhere; they will be Tsokays." I mention this, because I was glad to note that Mr. Smyth looks with approval on the way women are treated in Siam. When I travelled in Burma I had many friends among the peasants, proprietors of their own lands, and they would tell me of a bullock or a cart, "My wife bought that." A peasant would never dream of buying a bullock without his wife's approval, and that is how the ladies are regarded over the whole country. That is the wonderful difference between India, where I lived for many years afterwards, and the Burmans and Karens. I knew these people well, and when I came with my wife to a village and took up my quarters with the headman, the woman of the house would do the honours, make us comfortable, and take great pride in showing her the kitchen and all other household arrangements. I must ask your pardon for having spoken so long, but your president bears the responsibility of asking an old man to tell of his bygone days.

Mr. J. ANNAN BRYCE: I don't know that I have much to say, especially after the excellent illustrations which Sir D. Brandis has given with regard to the manners and customs of the people of whom I had experience further north. I may answer the question you asked him about the duties put by the government upon the export of various timbers. A great many people have felt aggrieved of late years at the action of the government in that particular respect, and they have urged upon the government, without success, the desirability of leaving these useful woods free of the heavy duties imposed upon them, which are tending very much to strangle the export, and encourage their use not only in the country itself, but for many purposes to which they might be applied in England. I know it would be possible to bring one of the most hard and lasting woods in the world for use in England to pave our streets, if it were not for the enormous export duty put upon it. It may interest you to hear something about the different races about which Mr. Smyth spoke. These Mons of whom he has spoken are a race extending right across the peninsula from Anam to Pegu, and the other races occupying the country, of which he speaks, came down and settled themselves in the middle of this Mon race, so as to split them into two branches, in Anam and Pegu. The Krans are probably previous inhabitants; and the Shans, as they have come to the coast, have been called Siamese, who, like the Burmans, irrupted subsequently from the north, and conquered the previous inhabitants of the country. But under the rule of the Siamese and British, these races get on very well together, Mr. Warington Smyth spoke of the amusement sometimes caused by the action of elephants when starting on journeys or while travelling. Like myself, he could tell many stories about them. I have seen sometimes a caravan delayed for a whole day in trying to catch an elephant, which, having found a nice deep pool in the river, prepared to disport himself there rather than march on the road under a hot sun. The mahout would go down the stream and get on his back, but the moment he began to use his goad the elephant would sink under the water, and of course the mahout had to come off. Another amusing story, which would be a pleasant illustration of the same kind of thing, happened in the timber yards of Rangoon, where we had a powerful and magnificent elephant, the very best I have ever seen, doing the work. Like the Kran ladies, he had considerable native ability, and was able at once to find the centre of gravity of a large piece of timber. He would walk up straight to a very heavy slab, which was naturally much thicker at one end than the other, and put his tusks under the exact part necessary to lift it without any fumbling. These elephants sometimes get into a state of wildness (must), and it is known when this is coming on by an exudation from the forehead, which ceases when that state passes off. This elephant had a peculiarity, in that the exudation used to stop long before he was in a safe state. One day when he was being taken out to-work in the mills, he suddenly developed a homicidal tendency. The mahout was too quick for him, and got into a pond where the water for the engines was stored. The elephant then commenced to pelt him with pieces of timber, but he succeeded in scrambling out on the other side. There were fourteen or fifteen other elephants in the mill; these he drove out. Unfortunately, at this moment Lord Ripon, who had come down from Burma, was anxious to see the working of the timber mill, which had been literally swept and garnished by the elephant. Day after day the elephant went out into the paddy-fields, like the one of which Mr. Warington Smyth speaks, did a great deal of destruction, and several people, I am sorry to say, were killed. We got a notice that this elephant must be caught and killed, and accordingly issued notices all round the country for the elephant-catchers to come and help us. They suggested, very naturally, that one of the best modes would be to dig a pit in the mill compound, as he might be induced to fall into it. Accordingly, it was dug, covered over so as to look like the rest of the ground, and one night, sure enough, the elephant came into the compound. But, unfortunately, they had not provided against the possibility of his getting out again. One peculiarity of elephants in general is the carrying about of a piece of timber, with which they scratch their backs, and with the help of this he somehow swarmed out of the pit. Well, then the old trouble began to repeat itself. He destroyed the paddy-fields and killed some more people. However, we finally circumvented him. A Madras coolie in the building suggested we might again dig a pit, fill it with mud, and cover it as before, tempting the elephant to go in by putting a dummy on the top and working its arms and legs. This was necessary, because the elephant, after falling into the first pit, never used to come into the mill without tapping the ground in front of him with this piece of log. We therefore rigged up the scarecrow, and watched for an occasion when the elephant came in, that we might tempt him. One day he was driven in by the hunters, and, when enraged by their shouts, saw the figure waving its arms and legs. He accordingly charged it, and tumbled into the pit. This time he was unable to get out, but lay there until he was exhausted with hunger. He was then pulled out with chains, and never said a word afterwards.

The PRESIDENT: We must thank Sir Dietrich Brandis for his interesting address, and also Mr. Bryce for his entertaining anecdotes. Mr. Warington Smyth's paper was curtailed for reading. It contains a great deal of very interesting and valuable geographical information, especially respecting the ancient and modern races in this country, which will be printed in its entirety. To my mind Mr. Warington Smyth's style is admirably adapted for geographical description. It is lucid, clear, and most interesting, and, above all, every line seems to overflow with the interest he takes in whatever he sees, and his sympathy with all the people he meets. We must all regret he is not present, and I am sure you will instruct me to convey to him our very warmest thanks for his valuable and interesting paper. We must not adjourn without thanking Mr. Probyn, his friend, for having so kindly read the paper.

ON THE GENERAL CONFIGURATION OF THE EARTH'S SURFACE.

By Sir JOHN LUBBOCK, Bart., M.P., F.R.S.

IN 1887 I sent to *Nature* a letter, of which the following is a copy:—

" *On the Southern Tendency of Peninsulas.*

" SIR,—The attention of those interested in physical geography has long been attracted to the remarkable fact that almost all the great peninsulas of the Earth trend southwards, and that the majority, at any rate, have an island or group of islands at their southern extremity.

"Thus Mrs. Somerville, calling attention to this, says: 'The tendency of the land to assume a peninsula form is very remarkable, and it is still more so that all the peninsulas trend to the south—circumstances that depend on some unknown cause which seems to have acted very extensively. The continents of South America, Africa, and Greenland are peninsulas on a gigantic scale all directed to the south; the peninsulas of India, the Indo-Chinese peninsula, those of Korea, Florida, and California in North America, as well as the European peninsulas of Norway and Sweden, Spain and Portugal, Italy and Greece, observe the same direction.

"'Many of the peninsulas have an island or group of islands at their extremity, as South America, which is terminated by the group of Tierra del Fuego; India has Ceylon; Malacca has Sumatra and Borneo; the southern extremity of Australia ends in Tasmania or Van Diemens Land; a chain of islands runs from the end of the peninsula of Alaska; Greenland has a group of islands at its extremity; and Sicily lies close to the southern termination of Italy.'

" Now, may we not correlate this with the remarkable preponderance of ocean in the southern hemisphere, which M. Adhémar has suggested to be due to the alteration of the centre of gravity of the Earth, caused by the great southern cupola of ice?

" However that may be, the preponderance of water in the south is very remarkable. Taking each parallel as unity, the proportion of sea is as follows:—

[The figures I gave were slightly different. I have substituted those resulting from more recent studies.]

60° North	0·392	10° South	0·795
50° „	0·438	20° „	0·763
40° „	0·538	30° „	0·797
30° „	0·567	40° „	0·961
20° „	0·674	50° „	0·983
10° „	0·758	60° „	1·000
0° „	0·783		

"Without, at the present moment, entering upon any discussion as to the cause which has produced this remarkable result, the fact, at any rate, seems to throw some light on the southern direction of promontories, for which, as far as I am aware, no cause has yet been suggested. For let us suppose three tracts of land, each trending north and south, each with a central backbone, but one with a general slope southwards, one with a northward slope, and the third without any. The first will, of course, form a peninsula pointing southwards, because, as we proceed southwards, less and less of the surface will project above the water, until nothing but the central ridge remains. The second tract, however, would also assume the same form, because, though by the hypothesis the land does not sink, still the gradual preponderance of water would produce the same effect.

"If, however, the central mountain ridge, as is so generally the case, presents a series of detached summits, the last of such elevations which rises above the water-level will necessarily form an island, situated, with reference to the land, like those mentioned by Mrs. Somerville.

"Lastly, in the third case, the gradual diminution of water would tend to neutralize the effect of the slope, and if the two were equal, the land would form, not a pointed peninsula, but an oblong tract.

"If there is anything in the above suggestions, it will throw some light on the southern trend of peninsulas by bringing them under the general law to which is due the remarkable preponderance of ocean in the southern hemisphere.

"JOHN LUBBOCK."

Mr. Francis Galton, however, pointed out to me a difficulty in this suggestion, viz. that no additional depth of water in the northern hemisphere would have any similar result. I tried several hypothetical cases, and the statement is no doubt correct. The difficulty has puzzled me much, and I now venture to lay the following consideration before the readers of the *Geographical Journal*. I have elsewhere pointed out * that if the elevation of folded mountain chains be due to the gradual contraction of the Earth, then—though, so far as I am aware, no attention has yet been called to it—the compression and consequent folding of the strata would not be in one direction only, but also in a second at right angles to it, though the amount of folding might be greater in one direction than in the other.

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* 'Beauties of Nature,' p. 295.

This, I think, accounts for many points in the configuration of mountain districts, and for the many cases in which rivers bend at right angles. If, however, folded mountains are due, as thus suggested, to a diminution of the diameter of the Earth, every great circle must have participated equally in the contraction. The east and west folds would, on the whole, counterbalance those from north to south. This must be so theoretically, but we have no means of testing it by figures. It is interesting, however, to observe that, while the mountain chains of the Old World run approximately from east to west, those of America are, in the main, north and south. Speaking roughly, the one series would seem to balance the other, and we thus get a clue to the remarkable contrast presented by the two hemispheres. Again, in the northern hemisphere we have chains of mountains running east and west—the Pyrenees, Alps, Carpathians, Himalayas, etc.—while in the southern hemisphere the great chains run north to south—the Andes, the African ridge, and the grand boss which forms Australia and Tasmania.

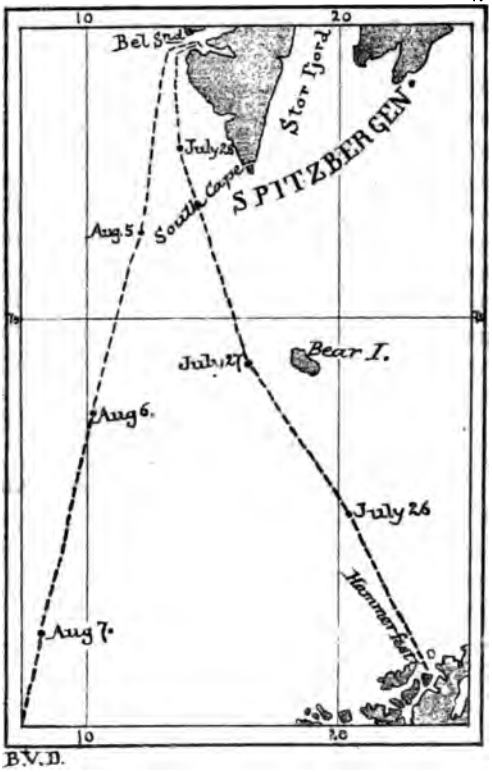
This, then, seems to me the answer to the difficulty suggested by Mr. Galton.

The explanation of great mountain ridges by lateral pressure and consequent folding, coupled with the necessity of approximately equivalent contraction along every great circle, explains the balance of east to west and north to south chains in each hemisphere; and this again, in conjunction with the preponderance of water in the south, explains the tendency of land-masses to taper southwards, and end with an island or group of islands, thus throwing an interesting light on some of the principal features in the configuration of the Earth's surface.

VISIT OF THE TRAINING SQUADRON TO SPITZBERGEN IN THE SUMMER OF 1895.

The following account of the visit of the Training Squadron, under the command of Commodore Atkinson, to Spitzbergen in the summer of 1895, has been drawn up by Commander C. H. Coke, R.N., and Lieut. J. P. Rolleston, R.N., of H.M.S. *Active*. The stay in Bel sound was very interesting, and the officers occupied themselves in observing and photographing, in making a survey of Recherche bay, and in examining the glaciers. This communication is a very welcome one, and the excellent photographs by Lieut. Drummond and Mr. J. E. Corbett will form a valuable addition to the Society's collection. It is to be hoped that this will not be the last cruise of the Training Squadron which, while instructive for officers and men, will also be of interest to geographers.

NARRATIVE.



TRACK OF THE TRAINING SQUADRON, 1895.

July 25.—Having heard from three sealing schooners that there was no ice about Bear island, to the south of Spitzbergen, the Training Squadron, under command of Commodore George L. Atkinson, consisting of H.M. ships *Active*, *Volage*, *Ruby*, and *Calypso*, left Hammerfest, the most northern town in Norway, under steam at 10 a.m., and, passing along the east and north shores of Soro island, stopped for two hours to fish for cod, of which about ninety were caught; then proceeded for Spitzbergen.

Nothing of note occurred on the voyage up, light winds and fine weather being experienced the whole way; there was very little fog, and no ice was seen at sea.

July 27.—The squadron passed about 16 miles south-westward of Bear island, which is 110 miles southward of Spitzbergen, in soundings of a little more than 100 fathoms. The weather being beautifully clear, a good sight of this barren-looking island was obtained, Mount Misery, at the south end, being a very conspicuous snow-capped mountain.

In expectation of cold weather, crow's nests were constructed at the fore topmast-heads of the ships for the look-out men, and blanket suits supplied for those on watch; but, as the temperature rarely fell below 40° Fahr., these precautions were hardly necessary.

Between the two islands numerous whales and small guillemots were seen; a small whaling schooner was also observed.

Sunday, July 28.—The squadron passed along the west coast of Spitzbergen, at about 25 miles. South cape was not seen owing to the mist. The general appearance of the land is very remarkable. Innumerable sharp peaks stand up, all about the same height, from the vast expanse of ice and snow; nearly all the valleys are filled with glaciers running down to the sea. The effect is not as white as one would expect, many of the hills being too steep for snow to lie on them. The air is so clear that the land looks much nearer than it really is.

Bel sound makes like a deep opening between high land, but, on nearer approach, the north and south entrance points are seen to run out low for some distance from the bottoms of the hills; the north point in particular stretches out a long way, and is said to be dangerous to approach.

SOUTH-WEST PART OF RECHERCHE BAY.

July 29.—The squadron entered Bel sound and anchored in the south-west part of Recherche bay, in 18 to 20 fathoms, in the early morning.

The scenery is very fine, but terribly bleak-looking and drear. The mountains run in ridges down to the sea, serrated and sharp in outline against the sky. Tremendous glaciers almost fill the valleys—the work of countless ages—which gradually work their way to the sea, forming icebergs. The higher hills are covered with perpetual snow.

A strange silence prevails throughout, now and again broken by sounds resembling the roll of thunder or the discharge of heavy artillery, due to the cracking of these huge masses of ice. Nature seems torpid; no vegetation anywhere to be seen, except here and there, on the sides of the hills, patches of moss, and a few stunted Iceland poppies. Seals abound, and in the morning one or two may generally be seen resting on the small icebergs which are scattered about the bay. Although the seine was hauled, no fish of any description were caught. Brent geese, eider duck, gulls, terns, and petrels are plentiful. Many nests and eggs of duck and tern were found on the island in the south-west corner of the bay, named by our surveyors "Training Squadron islet."

Recherche bay, so named after the French corvette *La Recherche*, which went there in 1838, in lat. 77° 30′ N., long. 14° 36′ W., affords capital anchorage in about 20 fathoms. Advantage was taken of the stay of the squadron to make a thorough survey of the place, a portion being allotted to each ship. The work was thoroughly done, twelve officers and about forty men being employed, the navigating officer of each ship being responsible for his portion, the whole under the superintendence of the navigating officer of the *Active*. The old French plan was found to be very correct. This magnificent bay is about 3½ miles long by 2½ miles wide, and practically clear of danger except near Reindeer point, from which foul ground extends for about half a mile. The mountains on either side are about 2000 feet high. At the head of the bay stands Observatory mountain, 1898 feet high, on which the officers of *La Recherche* established their observatory in the summer of 1838. No traces of it remain, but in an old cairn on the mountain-side one of the *Active's*

PART OF THE FACE OF EAST GLACIER.

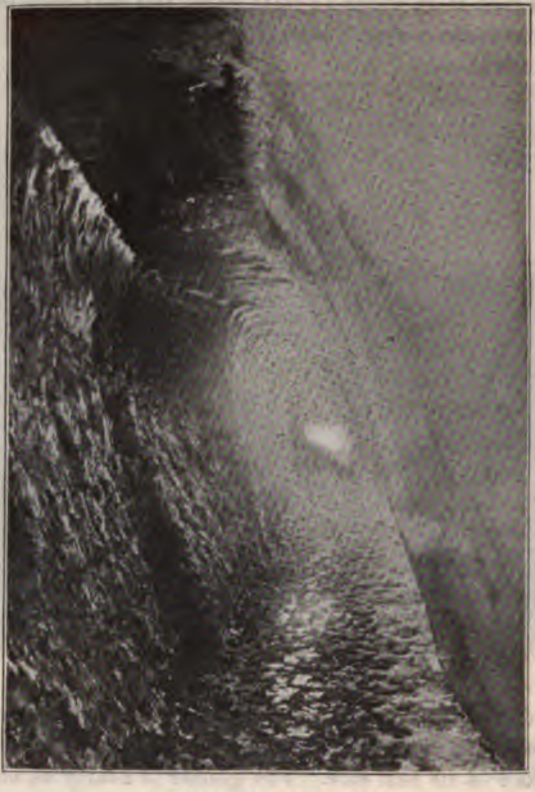
seamen found a sealed bottle, containing the names of "Ch. Martins, Docteur en Médecine, 3, Rue Hauteville, and Monr. Auguste Bravae (Bravail), Officier de Marine, 26, Juillet, 1838, *Recherche*," and ten others, dated "le 2 Août." The bottle was replaced, several cards of officers of the *Active* being added.

Two large glaciers run down into the bay, forming parts of two of its sides. East glacier, so named by the French surveyors, apparently takes its rise from the interior ice-cap, and is probably about 30 miles long. At its face it is about 1½ mile wide, 100 feet high out of water, and 20 fathoms under water. It evidently has been at some time nearly a mile further out in the bay than it is now, the point on its west side being composed of old ice and *débris*, of which there is also a great deal along the shore on its east side. Fox glacier is nearly as big at its face, but it takes its rise in the hills on the west side of the bay, so that it is comparatively short. There is another large glacier about a mile eastward of Recherche bay. Large pieces of ice constantly break off the faces of the glaciers and float about the bay, and though none were seen large enough to incommode a vessel at anchor in the south-west part of the bay, it is not prudent to go close to the faces of the glaciers in boats or small vessels.

PART OF THE FACE OF EAST GLACIER.

Fortune favoured us during our stay with regard to the weather; only on one day did a gale of wind from the south-east prevent the survey being continued. The usual drills and exercises were carried out, and a cricket-match even was played on the south moraine of Fox glacier, commencing at 9.30 p.m. and ending in the small hours of the morning, illumined by the midnight sun. The temperature of the sea during our stay was from 39° to 42° Fahr., and of the air from 39° to 47°. The climate is bracing and very pleasant when it is calm, but any wind off the land blows icy cold. English winter clothes are quite sufficient in summer here.

Human remains were found on the hillside southward of Fox glacier, which appeared to have been disturbed by some animal. They were carefully interred by parties from the *Ruby* and *Calypso*, and a cross erected to mark the spot.



ICE CAVE IN EAST GLACIER.

A feature of much interest was a cave in the East glacier close to the water's edge, formed, it is supposed, by some sub-glacial stream in years gone by. It is from 6 to 8 feet broad, 20 feet high, and extends far into the glacier; and as the ice on the top was, for some distance, not too thick to prevent the light penetrating, the effect was most beautiful.

A stream flows from Fox glacier through Fossil beach, so called from the numbers of fossil bones found thereon, many of which were brought away by officers of the squadron.

August 2.—The Norwegian schooner *Willem Barents* came into the bay. Mr. Martens Ekroll, the owner of the vessel, a Norwegian gentleman, came on board the *Active*, and from him the following information was obtained:—

He had come up on a hunting expedition, and had wintered in the schooner on the south-west coast of Edge island, having one station to the north and another to the south of him in Stor fiord. His crew had consisted of eleven all told. One had been lost in a snowstorm while following a bear, and was not seen again; another had died during the winter. They had received no news from the outside world for a whole year. He had so far secured sixty-three polar bear skins and about a hundred and fifty seal-skins, the former being worth to him from £5 to £6 apiece, and the latter, which are the hair seal used for leather, about 10*s*. each. It surprised us to hear that the polar bear is a cowardly creature, which invariably runs away when pursued. They had a cub in a cage on board whose mother they had killed.

They did not find the cold intense till after December. He and his company suffered, whenever the wind blew from south-east, from what he calls malarial neuralgia. It affected his eyes, giving him great pain and causing the right eye to become suffused with blood; others suffered from pains in the back and limbs. Quinine was useless; Fowler's solution was the best remedy. He found the thermometer on shore, although it was exposed, was about 3° higher than that in the ship.

The water round King Ludwig and Thousand islands was open all the winter. Stor fiord may be clear in the summer and yet inaccessible, because the ice occasionally stretches across its mouth, and in the summer Olga strait is clear; but the east coast of Edge island is inaccessible, and has been for some years. From observation he has found the warm current in Hinlopen strait, although the strait was not open; also in Helis sound and Freeman's strait. This, he considers, opens Olga strait.

From here we learned that the position of the eastern pack governs the condition of the ice and season on the west coast. In winter it never comes west of Spitzbergen south cape, slanting towards Bear Island. It breaks up in July or August, freeing the floes which drift round the south cape. Near Dun Islands the melting of these floes is forming a bank of shoal water, which is increasing. Bel Sound is nearly always open as far as Fox point. Recherche Bay freezes early, sometimes in September, and is not open till June or July. Magdalena Bay is more open in the early part of the summer than is Recherche bay.

The northern pack never comes south of Cloven Cliff. This is a bad year for ice in the north, as the northern pack is close down to the north coast of Spitzbergen.

August 4.—The squadron sailed on their homeward voyage, each ship firing a shell from a heavy gun at the Fox glacier as a last farewell to the ice-bound regions, arriving off Aalesund, in Norway, on the 10th, and so ended a most instructive and interesting voyage.

RECENT RUSSIAN GEOGRAPHICAL LITERATURE.

Russian geographical literature has lately been enriched by several very valuable works and publications. Foremost among them stands two new volumes of the Russian Addenda to Karl Ritter's 'Asia,' which had been interrupted for some time, but now, owing to the unabated energy of the Vice-President of the Society, P. P. Semenoff, and the excellent work done by I. D. Chersky during the last few years of his life, have begun to reappear. The first of these two volumes contains the description of "The Sayan Highlands, in the limits of the government of Irkutsk and in the south of the Siberian highway, to the south-west extremity of Lake Baikal;" while the second is "A General Review of the Baikal Mountains and Lake Baikal, its north-western coast, up to the mouth of the Upper Angara, and the Primorskiy and Onot ridges." If one takes into account the amount of exploration which has been made for the last thirty years in these two regions, as also the fact that most reports of these explorations published in the very little known 'Memoirs of the East Siberian Branch of the Geographical Society,' were for the most part destroyed by the Irkutsk conflagration, and therefore were almost entirely unknown even in Russia itself, one can fully realize the value of these two volumes, of over six hundred pages each. On this account only, they would be a unique source of information about an immense region, full of the most interesting physical, geological, and ethnographical features. Sufficient to say that the Sayans—that immense border-ridge of the great East Asian plateau, which contains in the Munku Sardyk group the only snow-clad peaks and glaciers of southern East Siberia, and was during the Tertiary age the seat of a great volcanic activity—as also Lake Baikal, such as we now know it after the explorations and soundings of Godlewski and Chersky, enter into the two volumes. But it must also be said that all the mass of recently accumulated materials was worked out, first, by so giftful a writer as Chersky was, and that his unfinished work was terminated and retouched by P. P. Semenoff, who has given to it the scientific finish and the thorough understanding of nature which characterized the very best, earliest productions of the same writer in his Addenda to Ritter's 'Asia' for the Tian Shan and the Amur region. The northern part of the government of Irkutsk, as well as Transbaikalia and the Gobi, will make the subject of three more volumes of the same series.

The yearly Report of the Russian Geographical Society for the year 1894 contains more than the usual wealth of information about work done in Russia, inasmuch as it embodies this year the reports of two branches of the Society, the East Siberian and the West Siberian Branch. In these last we find also summaries of all the articles contained during the year 1893 in the 'Memoirs' (*Zapiski*) and the 'Bulletins' (*Izvestia*) of the two always active branch societies.

The fourth volume of the *Annuary* (*Ezhegodnik*) of the Russian Geographical Society is also out, and contains excellent reviews of the work done by the General Staff surveyors in 1894; of the surveys made for the Ministry of State's Domains; of the progress of meteorology in Russia in 1892, by B. I. Sreznevsky; and of botanical geography, by I. I. Kuznetsov—this last being a very elaborate paper of eighty pages, in which the work done in West Europe in connection with the vegetation of the Tundras and the Steppes is discussed as well.

Of the several volumes of Memoirs (*Zapiski*) lately issued by the different sections of the Geographical Society, we must mention first of all ('Ethnography,' vol. xxiv.) the translation of the Chinese work, 'Men-gu-yu-mu-tsi' ('Memoirs on the Mongol Encampments'), by P. O. Popov, General Consul at Pekin. This remarkable production of two Chinese geographers, Chjan-mu and Khe-tsyu-tao, gives, on its first 157 pages, short topographical descriptions of the territories occupied by the different Mongolian *aimaks* (tribes) and confederations of *aimaks*, as well as short historical notices about each of them; while the remainder of the volume, *i.e.* over three hundred pages, is given to footnotes, which contain the greatest variety of miscellaneous information about the above territories and their inhabitants. Another volume of the same series, 'Smolenskiy Etnografichskiy Sbornik' ('Ethnography,' vol. xxiii.), is devoted to the folklore of Smolensk, and a third to the folklore of Macedonia.

As to the last issues of the Bulletins (*Izvestia*) of both the Russian Geographical Society and its East Siberian Branch at Irkutsk, they are, as usual, full of interest. The paper which is sure to be looked at first by the geographer is V. A. Obrucheff's paper on "Middle Nanshan." The explorer gives in it the results of his journeys in the middle portion of the highlands, where he was enabled to verify his suggestions relative to the directions of the main mountain ranges, and the connections existing between the ranges crossing at the northern end of the system and those at its southern end. He gives now his final results in a sketch-map which represents the positions of the different ranges, and the names given to them by both the explorer and the Geographical Society. Another paper is a report of the same explorer's journey from Su-chau to Kulja. MM. S. N. Nikitin's and Pashkevich's paper on the altitudes of the region between the Volga and the Ural rivers, with a map, throws a good deal of new light on this interesting part of

Russia. The same issue (1894, V.) contains a very elaborate paper by A. I. Woeikoff on the variations and secular changes of climate; and a note on the earthquake in San-ju, China, is also worthy of mention.

As to the East Siberian *Izvestia* (vol. xxv. 1, 2, and 3), they contain a very valuable new list of altitudes obtained by levellings in Transbaikalia; two botanical papers on the vegetation in the Baikal region, by Y. Prein; a summary of the important and well-known discoveries made by the deciphering of the Runic inscriptions on the Orkhon and the Yenisei; and various notes (the Flamingo in Siberia, D. Klements's expedition to Mongolia, etc.).

The rich contents of the last (XVI.) volume of the Memoirs (*Zapiski*) of the Caucasian Branch of the Geological Society has already been mentioned in a previous issue of this *Journal.* We have, moreover, received the nineteenth volume of that extremely useful serial edited by the Caucasus Educational Department, the 'Collection of Materials for the Description of the Localities and Inhabitants of Caucasia,' which contains, besides a profusion of materials for Caucasian folklore, a history of Temir-khan-shura, and descriptions of the town Kvirily and several mountain villages.

Russian geographical literature has also been enriched during the past year by a new geographical periodical, which has at once taken a place of honour among geographical reviews generally. It is the review *Earth Knowledge* (*Zemlevyedyenie*) issued quarterly by the Geographical Section of the Moscow Society of Friends of Natural Sciences (*Lubiteli Estestvoznaniya*), under the editorship of D. N. Anuchin. The Moscow Society, which has rendered such immense service in almost creating Russian anthropology, and which is well known to geographers by its throughly scientific and rich edition of the late Fedchenko's scientific explorations in the Tian-shan, has lately founded a Geographical Section, which now edits the above review. Quite a series of excellent papers has already appeared in the four issues of the Moscow review, some of them of a general character—"The Problems of Earth-knowledge;" "The Historical Development of Conceptions on the Surface Structure of Russia;" "Recent Researches into the Lakes of West Europe, with some Data Relative to the Lakes of North-West Russia," by D. N. Anuchin; "The Reaction of Man upon Nature," by Dr. Woeikoff, etc.—while the remainder deal with some new points of the geography of the Russian Empire. In this last department we find a series of valuable papers, mostly well illustrated, on the lakes invaded by vegetation and periodically disappearing in the Onega region; on Mount Iremel; on different parts of Siberia; on the mountain groups and glaciers of the Caucasus; M. Pastukhoff's journey to the highest villages of Caucasia, and his ascent of the Shah-dagh; A. N. Krasnoff's botanical notes from a journey to the far East; on the sources of the Moskva river; on the Kirghiz steppes; on the Northern Urals; and so on.

Short notes on geographical exploration in Russia are another useful feature of this periodical, which certainly will widely contribute to the development of taste in geography in Russia.

The same Society is also issuing its quarto volumes of 'Memoirs' (*Trudy*), of which we see often mentioned (although we have not received it) A. N. Krasnoff's very interesting work, 'The Grass Steppes of the Northern Hemisphere.'

And, finally,. the same Moscow Society has lately published in a separate volume, intended for a wider circulation, a collection of papers by Mme. Alexandra Potanina, accompanied by a touching biography (partly autobiography) of this remarkable lady traveller, who, like Mme. Olga Fedchenko and Mme. Chersky, not only accompanied her husband on all his journeys in Central Asia and China, but also was his faithful comrade and aid in collecting all sorts of information, geographical and ethnographical, about the visited countries. Thus she explored with her husband North-West Mongolia in 1876–77, Central Mongolia in 1879 and 1886, the Hansu borderlands of the East Tibet plateau and Lake Kokonor in 1884–86, and, finally, the least-known parts of East Tibet in 1892. She died in China, on October 1, 1893, before the caravan had reached the town Chu-sin-fu, where it was expected to find an English doctor, and her husband, broken down by this loss, returned soon to Europe. The collected papers of Mme. Potanina, contributed to various reviews, are lively descriptions of scenes from the life of the Buryates, and chiefly the Mongols.

Of privately issued geographical works we must mention a volume, 'China,' published at St. Petersburg by the General Staff, Colonel D. V. Putyata. It is a reliable description of the Chinese Empire, its inhabitants, its revenue and trade, as well as of the military forces of the empire and its frontier with Russia from the military point of view. The work is illustrated by sixteen small maps.

It may be said, in conclusion, that, owing to the recent efforts of the Geographical Society and the Moscow Friends of Natural Sciences, there will be no difficulty in not only indexing the whole of the Russian geographical literature, when the much-spoken-of international publication for this purpose will be started, but also to find thoroughly reliable analyses of the chief papers and works, which will have only to be translated for universal use. Even now the *Annuaries* of the Geographical Society, translated in full, would be found to be of great benefit for Western geographers.

While the above goes to press, we learn that the Russian Geographical Society has just issued the first volume of the 'Work of the Russian Polar Expedition to the Mouth of the Lena,' *i.e.* of the expedition which was sent out in 1881–84, and consisted of H. D. Jurgens, Dr. Ant. Bunge, and A. G. Eigner. The first half of this volume contains the astronomical and magnetical observations, while the second part, edited by Dr. Bunge, is given to the description of the extremely interesting journey itself, and is full of interesting details relative to the flora and fauna of the country, the extension of forests and of ever-frozen soil, as well as the life of the Yakutes.

THE PORTUGUESE EMPIRE IN THE EAST.*

HAVING regard, on the one hand, to the peculiar interest attaching to the rapid rise to supreme power in the East of a nation possessed of such limited resources as Portugal, and on the other to the number of contemporary historians of that nation who wrote voluminous accounts of the doings of their countrymen, it is certainly surprising that so little should hitherto have been done to bring before English readers a connected account of the steps by which such vast results were attained. One of those historians, it is true, found an English translator two centuries ago; but in the case of the other and more standard writers, the voluminous nature of their works apparently proved a deterrent. It is, therefore, matter for satisfaction that Mr. Danvers should have followed up his official researches into the records—both English and Portuguese—relating to India and the East, by bringing together from such records, as well as from the above-mentioned sources, an account of "the principal events connected with the rise of the Portuguese nation, and with the development and decline of their Eastern Empire." The history of a period so extended—for, while directing his chief attention to the more stirring events of early conquest and international rivalry, the author traces the fortunes of the Portuguese possessions down to the present day—cannot, of course, be treated of exhaustively, even in the two thick octavo volumes now before us, but the connected view here presented cannot fail to be useful to all students of European enterprise in the East.

It is possible here to touch on a few only of the most interesting and eventful periods of the history, passing over the first opening up of intercourse with the East under Vasco da Gama and his immediate successors as more familiar to English readers than the history of its subsequent development, to which the ambitious schemes of the great Albuquerque contributed so largely. Mr. Danvers helps us to trace the influence, not entirely beneficial, of the policy of this great man on the future of the Portuguese power. Whilst others aimed merely at the opening of trade relations with the various Eastern nations, he sought to emulate Alexander the Great by the establishment of a vast territorial dominion, such as could not fail to overtax the resources of so small a country as Portugal. His zeal in this direction may be judged from the fact that of the three great Eastern emporia of commerce, whose traffic made so much impression on mediæval travellers like Abd-er-Razzak, Varthema, and others, he had at the time of his death already subjugated two, Malacca and Ormuz, and was contemplating the completion of Portuguese ascendancy by the reduction of the third, Aden. According to his 'Commentaries,' * he had brought completely under his influence all the countries from Ormuz to Cape Comorin, while eastwards as far as China all the kings were in friendly relations with him.

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* 'The Portuguese in Asia.' By F. C. Danvers. London: W. H. Allen. 1894.

From a geographical point of view, perhaps the greatest interest of the book lies in the facilities afforded for tracing the course of events by which, in the space of little over half a century, the coasts and seas of the whole of Eastern Asia, including the islands of the archipelago, were definitely made known to Europe. In so doing, we are struck by the quiet way in which such vast additions to the knowledge of the world were made, the history of actual discovery being not bound up with the names of great captains, such as those whose exploits in the New World were so fully chronicled by historians. This is due, no doubt, partly to the fact that accounts of the far East had already been given, however vaguely, by the mediæval travellers, and partly to the different political relations which prevailed, these being confined chiefly to the establishment of trade, or at most the erection of forts, along the coasts. Of the first expeditions to the Moluccas under Antonio de Abreu (1511), to China under Fernão Perez de Andrade (1516), and to Japan under Antonio de Mota (1542), we have to be content with very meagre details, and as a rule the individual voyages were on too small a scale and of too short duration to rank with those of the great navigators of the world. Those of Mendez Pinto, which, as regards their extent at least, might form an exception, are only incidentally referred to in the book.

The principal scene of the events treated of is of course India and the neighbouring countries, and here the reader may follow in detail the various wars with native rulers by which the Portuguese power was established on the West Coast; the operations in the Red Sea and Persian Gulf, with varying success, against the Turks, Arabs, and Persians; the part taken by the Portuguese in the native wars in Ceylon; their rivalry with the English and Dutch, and expulsion by the latter from Ceylon and the Archipelago; their struggle with the Mahratta power, and the decline of their influence on the Bombay coast, with a corresponding increase of that of the English; and the final decay of their power, due to a variety of causes, but principally to the exhaustion of revenue by misappropriation of funds, to the decline of trade owing to bad fiscal policy, and to the ill effects of the establishment of the Spanish dominion over Portugal.

The book is illustrated by reproductions of old maps, portraits, and views of places, and a copious index is added, the value of which is,

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* An English version of which has been published by the Hakluyt Society.

however, lessened by the fact that under the main headings the separate entries are arranged, not chronologically, but alphabetically, the order thus depending merely on the chance form of words employed. This is especially to be regretted in a work covering such a wide extent, both of time and place, in which the details referring to any one person or region are necessarily scattered far and wide amidst the general mass.

THE GALÁPAGOS ISLANDS.*

By Dr. WOLF.

THE position of the Galápagos is very isolated. They lie at a distance of 600 nautical miles from the South American continent, and 3000 miles from the nearest Polynesian Islands, the Mendoña Archipelago; and since at the time of their discovery by the Spaniards in the sixteenth century they were uninhabited, and owing to their general barren and stony character did not invite settlement, while up to the present day they have remained off the great trade-routes of the world, they have always attracted little attention. It was only in 1832 that the Republic of Ecuador took formal possession of them. Peru once or twice showed a disposition to annex them, and the United States attempted to acquire them by purchase, but still Ecuador remained in the end in undisturbed possession of them. Only within the last fifteen or twenty years, since the cutting through of the Central-American isthmus was set on foot, has the general interest been more directed to this archipelago, for it will lie on the main route from Panama to Polynesia and Australia, and form a most favourable point for the establishment of a coaling-station. Ecuador has likewise recognized the importance of the islands for the future, and has, since 1885, named a governor and other officials for them, although only one island is inhabited, and that by only two hundred persons. The islands were made known to science by Darwin during the voyage of the *Beagle*.

The group is scattered over a water-area of over 23,000 square miles, and yet the total land surface amounts to only 2870, of which 1650 fall to the largest island, Albemarle. Altogether there are thirteen islands, exclusive of the many small islets and rocks. The geological and topographical character of the islands is exceedingly plain and simple. They form one of the best examples of formation by volcanic action pure and simple, through the piling up of eruptive matter. Nowhere is an old non-volcanic formation to be seen, and nowhere is the simple geological structure disturbed by extensive displacements or dislocations, while even the surface has lost hardly anything of its original form by erosion. Both an older and a more recent period of eruption are to be observed. During the former the outbreak took place beneath the sea, and must have yielded an enormous mass of material, forming the basis on which the more recent sub-aerial peaks were raised above the exceedingly deep sea-bottom. Petrographically, the old volcanic products are distinguished by the presence of Palagonite and other stratified tuffs with the character of sandstone, whilst the more recent consist entirely of vast streams and layers of lava, almost devoid of tuffs.

The old tuff formation occurs nowhere in extended masses, but appears only sporadically in the form of horseshoe craters in the lowest parts of the islands, or emerging from the sea, but never in the higher interior parts. Even from a distance they are distinguishable from the darker lava-formations by their smooth forms, their striking stratification, and their bright brownish-yellow colour. If they rise directly from the sea, they are more or less broken by the swell, but the open side or lowest edge always faces the south or south-east, a proof that as far back as the time of their origin the prevailing current had a direction from south-east to north-west. A regular and very gradual rise of the old volcanic area to the extent of about 350 feet has apparently taken place, for up to that height scanty remains of marine molluscs occur in the tuff-strata. Darwin estimates the number of the craters at over two thousand, and this is perhaps not above the mark, if we include all the cones of eruption, often little over 150 feet high at the foot of the crater-peaks; but it would be certainly incorrect, if one were to speak of that number of volcanoes, in the same way as we cannot speak of the numerous eruptive cones on the slopes of Etna as separate volcanoes. The number of volcanic peaks proper, connected by a funnel with the more deeply seated focus of activity, is very limited, and could not exceed twenty-five. There are several islands which, like Abington, Bindloe, Hood, etc., as well as Indefatigable and Narborough, consist of a mere volcanic peak. In other cases two or three neighbouring peaks coalesce into a continuous ridge, as is to be seen on Santiago, South Albemarle, and South Chatham. These last two islands long consisted each of two separate islands, which became united by the latest lava-flows, which in each case formed an isthmus not many feet above the sea-level. It is plain in all cases how the islands have been enlarged from fixed centres by copious lava-flows.

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* Paper read at the Berlin Geographical Society, April 6, 1895.

The height of the islands bears a relation to their area. The smaller attain a height of 650 to 1600 feet; the medium-sized (Floreana, Chatham, Santiago, and Indefatigable), 2000 to 2300 feet; while the largest, Albemarle, rises sheer from the sea at its south-west point to a height of 5000 feet. It is remarkable that its four great craters, as well as that of Narborough, all reach almost exactly the same height of 3700 feet. Darwin is inclined to divide the islands and their main craters into four lines, generally parallel, and with a south-east and north-west direction, and derives them from the same number of volcanic fissures. Such a grouping in lines seems, however, very arbitrary, and we might with equal force lay down other connecting lines, as, *e.g.*, one through the major axis of South Albemarle and Indefatigable. Such attempts at grouping seem purposeless, if only for this reason, that we do not know how the submerged members of the group, which certainly exist, are disposed over the common foundation; for, as some of these peaks raise only their highest points above the sea (*e.g.* Hood, Barrington, etc.), in like manner it is very probable that others do not reach the sea-level at all. To geologists it is particularly striking that this great volcanic region should be totally wanting in loose erupted matter, *i.e.* volcanic tuffs, with the exception of the above-mentioned old Palagonite-tuff and beds of volcanic sands and ashes, and in accumulations of large ejected blocks and bombs, if we disregard a deposit of basaltic pumice in certain bays on the east coast of Albemarle. The impression prevails that these volcanic mountains originated in fairly quiet but copious outflows of lava, at one time very viscid, at another very liquid in its flow. The great petrographic uniformity of the material of these islands, which is exclusively black or brown slaggy lava, usually feldspathic basalt, stands in marked contrast to that of the volcanic highlands of Ecuador, with their great variety of andesites. In this respect the Galápagos have their closest analogy, perhaps, in the basaltic lavas of the Hauran mountains in north Arabia. In any case the age of the group is, geologically speaking, very recent, and credible authorities even speak of volcanic outbreaks from the great crater of Narborough during the historic period, which, for these islands, goes back only three hundred years. On the other hand, it is very difficult to attempt estimates of age in a land which is entirely wanting in the results of erosion and in sedimentary deposits, and where, except on the coasts, almost every stone still lies on the spot where the volcanic force placed it thousands of years ago.

The climate of the islands is largely influenced by the fact that they lie in the midst of the cold Peruvian current, which at Cape Blanco, in 4° S. lat., trends away from the Peruvian coast towards the north-west. The water-temperature among the islands only ranges between 70° and 74° Fahr., and the yearly mean is 11° lower than on the neighbouring continental coast of Ecuador. To the same local cause is to be attributed the great scarcity of rain, which in many years is entirely wanting, as on the Peruvian coast. The rainy period falls at the same time of year as that of West Ecuador, but is much shorter. In favourable years there are frequent bursts of thunder-rain, especially from February to April, but their effects are hardly perceptible in the lower parts, below the height of 800 feet. The rain is at once sucked up by the porous slaggy lavas as by a sponge, and sinks through, so that no permanent streams or springs are formed, and the scanty vegetation of the lower zone presents no fresher appearance in the wet than in the dry season. From May to January it never rains within the coast zone.

The conditions are very different in the upper region, above the height of 1000 feet. Although during the short rainy season proper the precipitation is not much more considerable than in the coast-region, during the long so-called summer the mountains are frequently, and from July to November almost perpetually, wrapped in thick mist and clouds, and these condense into the fine drizzling rain (garuas), which often falls uninterruptedly day and night, or at intervals five or six times in the day. It may be affirmed that on the upland regions it rains more in summer than in winter, and the perpetual moisture operates in a quite different way from the heavy but transient winter rain. Even here there is no formation of streams and springs, but the soil is equably and deeply saturated with moisture; the basaltic slaggy lava is decomposed, to an average depth of almost 2 feet, into a blackish-brown earth, and overspread with an evergreen covering of vegetation, certainly not luxuriant, but still thick and pleasing to the eye. The contrast between the lower dry and the upper moist zone is a surprising one, and the transition takes place very suddenly, especially on the west side of the islands. In some hollows of the upland region thin layers of clay have been deposited, which do not allow the water to percolate, and in such places shallow pools are formed, which become filled principally by the winter rain, and dry up entirely only in years with little rainfall. They are surrounded by swamp-vegetation, and frequented by wild ducks. As a general rule the water sinks at once into the ground, and it is only on the larger islands at a few points in the middle and lower region that it sees the light again in the form of dropping springs. On the level sea-beach one often finds, on digging holes about 6 feet deep, brackish water which rises and falls with the tide, and which sometimes misses little of being drinkable. The scarcity of good and abundant drinking-water would prove a great obstacle in the way of future colonization, in spite of the extremely healthy and pleasant climate. The temperature is subject to no great daily or yearly variations. In the lowest zone the mean amounts to about 70° to 72° Fahr., but in the two *haciendas* on Floreana and Chatham only to 66° at a height of 920 feet, and on the pampas of the higher regions, 1300 to 2000 feet above the sea, only to about 61° to 63°; whilst at an equal height on the mainland there is still a luxuriant tropical vegetation, with a mean temperature of 73° to 75° Fahr.

The vegetation of the two zones in the islands is entirely different, and scarcely a dozen species could be found common to both. In the lower zone, up to 650 feet, the ground is very incompletely covered: black, brown, and red lavas everywhere crop out among the brushwood, which, as a rule, has small grey foliage and quite inconspicuous flowers. The plants that thrive best here are two gigantic cacti, one a columnar cactus 20 feet in height, and the equally tall *Opuntia galapageia*, which bears a green crown with pendent branches at the top of a tall and thick cylindrical stem. These two plants choose places where otherwise nothing grows, and often crown the edges of the craters of the black lava-cones. There are extensive districts—extending on Albemarle and Narborough to an area of several square miles—where absolutely nothing grows, and where the ground appears paved with enormous lava blocks. In the lower zone of Chatham, Darwin obtained only 10 species of plants, and must have collected in a very barren spot, for the number may be estimated at 50 to 60 species. The shore vegetation apparently contains not one endemic form, and agrees with that of the mainland, even some growth of mangroves having established itself in favourable localities. The transition from the lower to the upper zone is formed by a peculiar intermediate zone, which is characterized especially by a bearded lichen, and which occupies a height of 650 to 800 feet above the sea. This lichen occurs in such quantities on all the shrubs and trees, with tufts a yard long, that the zone to which it gives its impress can be distinguished as a horizontal white stripe even from a distance on board ship.

At a height of 800 feet the scene suddenly changes: a fresh, damp, south-east wind is met with on the plateaux, and the level ground is covered like a meadow with a short thick turf, while patches of wood and bush, covered with thick foliage, are dotted about the surface as in a park, or clothe the slopes of the higher ridges in more continuous masses. The trees have as a rule thin stems, and are seldom much over 30 feet high. This wooded region is followed, at heights between 1600 and 2000 feet, by a zone bare of trees and shrubs, but covered with coarse tufted grass, which naturally attains a considerable extent on the larger islands only. The vegetation of the islands is entirely wanting in tropical characteristics, the eye being greeted by no palms or tree-ferns, and by no beautiful or striking flowers. Although the upper region is in part very fertile, scarcely a tenth of the whole surface is cultivable.

The fauna is just as peculiar as the flora. Only one indigenous mammal is known, a rodent of the size of a rat; but even this is rare. The domestic animals, which have now run completely wild, seem not to have existed in Darwin's time. On Floreana and Chatham there are large herds of wild cattle as well as goats; on Indefatigable numerous troops of donkeys; pigs on Santiago especially; whilst a large reddish-yellow dog is to be met with on all the islands, and fine cats—strange to say, all black—live in the bare lava-clefts of the sea-shore. All these animals seem to thrive well in the climate of the islands, which secures immunity from tropical pests and vermin.

The tameness of the land-birds which Darwin noticed, can be fully confirmed at the present day. Some were captured by the writer, which settled on his head and shoulders; and in Albemarle even a falcon, which is plentiful there, would approach so near that numbers could be killed with a stick. On the other hand, all the swimming and wading birds, with the exception of an indigenous gull, are extremely shy; so that on the Galápagos the tameness or shyness of the birds can be taken as a pretty certain guide in deciding whether they are indigenous or the reverse.

The first place in the animal world is taken by the scaly reptiles. Snakes were found on four of the islands, and a different species on each. They were easily caught, and not poisonous. Small lizards are very common, the most remarkable being the genus *Amblyrhynchus*, peculiar to the Archipelago. *A. cristatus* is the only living representative of the marine saurians; it attains a length of over 3 feet, and at ebb-tide hundreds are to be seen sunning themselves on the damp lava-rocks. When captured they made no attempt to bite, and seem to live entirely on seaweed. On account of its taste of train-oil, their flesh is not eatable. On the other hand, the flesh of the land species, *A. Subcristatus*, has a very good flavour.

The elephant-tortoise (*Testudo elephantopus*) is well-nigh exterminated on the larger islands, which are most frequently visited. It lives in both zones, but prefers the upper moist one. Its flesh is excellent eating, and the liver, fried in oil derived from the fat which surrounds the viscera, is one of the greatest delicacies.

THE MONTHLY RECORD.

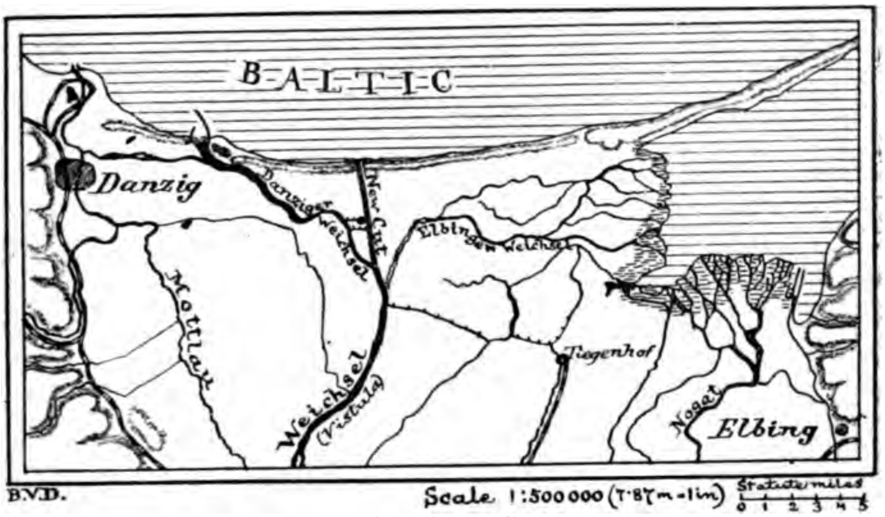
THE SOCIETY.

The French Government and the Recent International Geographical Congress.—Mr. Clements R. Markham, C.B., F.R.S., President of the Society and of the recent International Geographical Congress, has received the following gratifying communication from the French Ambassador: "Ambassade de France à Londres, 21 Novembre, 1895. Monsieur,—Le Gouvernement que je représente, sensible au gracieux accueil que vous avez bien voulu ménager aux délégués français qui ont assisté aux séances du Congrès Géographique tenu à Londres sous votre Présidence au mois de juillet dernier, m'a chargé de vous faire parvenir un témoignage de sa satisfaction. Il m'est particulièrement agréable d'être en cette circonstance l'interprête des sentiments du Gouvernement Français, et je suis heureux de saisir cette occasion pour y joindre l'expression de ma consideration personnelle. Veuillez agréer, Monsieur, les assurances de mes sentiments les plus distingués.—ALFD. DE COURCEL." "La témoignage de sa satisfaction" consists of a blue Sèvres vase.

Memorial to the late Lord Aberdare.—A committee has been formed at Cardiff for the purpose of obtaining funds for a memorial to the late Lord Aberdare. It is proposed to erect a statue of bronze at Cardiff, and to devote the surplus of the fund to the formation of a scholarship or fellowship in the University of Wales, of which Lord Aberdare was the first Chancellor. The Council recommend this memorial to the liberality of the Fellows of the Society, to which Lord Aberdare rendered eminent service as President and Trustee. Subscriptions should be sent to Henry Jones Evans, Esq., Lloyd's Bank, Cardiff.

EUROPE.

New Channel for the Lower Vistula.—At the cost of about one million pounds sterling, the branch of the Vistula which passes by Danzig to the sea has been deprived of further power to endanger the neighbourhood during river floods, and converted into a tranquil canal, suited for use as a harbour for timber-rafts. A new channel about 5 miles long has been cut from the point where the river swerved westward from its northerly direction; and through this channel practically the whole volume of the river has flowed directly northward to the Baltic since April last. The main mouth is now 12 miles distant from Danzig, but communication with the small branches running eastward has not been disturbed. The main object of the new work is to allow the ice of the Vistula to be carried quickly and harmlessly out to sea with the accompanying flood water in early spring.



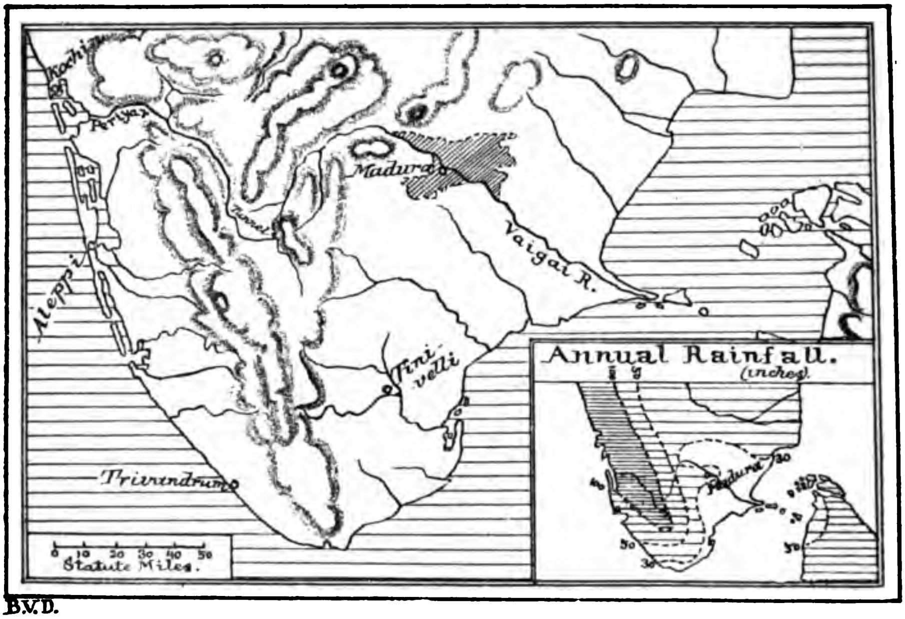
NEW MOUTH OF THE VISTULA.

The Lakes of the Riesengebirge.—On the northern slopes of the Riesengebirge are two small lakes, called the large and small "Koppenteich," from the neighbouring Schneekoppe. These lakes were made the subject of investigation as far back as the thirties by Count von Schweinitz; but it was only about 1880 that Professor Joseph Partsch recognized in their basin a remarkably fine type of a glacier-bed of the ice period, and they are mentioned in his classical researches on the glaciation of the Riesengebirge. Dr. O. Zacharias subsequently investigated the biological conditions existing in the Koppenteiche, and the discovery there, at an elevation of nearly 4000 feet, of species of *Monatas*, previously known only in the oceans, played an important part in the then unsettled question of "Reliktenseen," or isolated lakes, which at one time formed part of the sea. A second exploration of these lakes has recently been begun by Dr. Zacharias. Both lakes have steep craggy sides, which, at least in the case of the smaller Koppenteich, surround it so as to form a true "kar," or corry. An unusually large number of soundings have been made—350 in the larger lake, which covers only 16½ acres, and 300 in the smaller, not 6½ acres in extent. The former is shallow over about one-third of its area, where the depth is about 12 feet, while the remaining two-thirds form a "tub" with steep sides, in which the soundings average 75 feet: obviously the shallow part has been formed through filling up of the "tub" by landslips. The smaller lake is for the most part shallow (about 12 feet), with a depression close to the steep western shore, to a little over 20 feet. The origin of the large lake is traced to a landslip, in accordance with the views of Count von Schweinitz and Partsch, the dam having been formed by the higher and more extended side of the slip. At the beginning of summer the temperature of the water rises almost suddenly; in the smaller lake ice disappears about the end of May, and in the larger about a fortnight later. The estimations of the plankton, according to its weight and quantity, were made by the methods employed by Dr. Zacharias in the Plöne lake, in Holstein, and gave for the larger Koppenteich 3·4 cubic centimeters of plankton in one cubic meter of water. In the smaller Koppenteich, the bulk of microscopic organisms in the same quantity of water was about 3·9 cubic centimeters. The smaller numbers in the larger lake were counterbalanced by the higher proportion of the larger species. The mud, which forms a uniform covering on the bottom of the smaller lake at all depths below 12 feet, was examined for Dr. Zacharias by Professor Brün, of Geneva, one of the greatest experts in the lower plant-forms; and the interesting fact was brought to light, that in these German mountain lakes some species occur which are characteristic of *Alpine* basins (e.g. *Diatoma neesodon* and several *Melosiræ*), and one peculiar to Norwegian mountain lakes (*Melosina solida*). The investigations are to be continued next year, with special reference to seasonal variations of temperature, plankton, etc.

ASIA.

Mr. and Mrs. Littledale.—We are glad to learn by telegram that Mr. and Mrs. Littledale have arrived safely at Srinagar, Kashmir, from their journey across Tibet. We may hope to hear an account of their travels at an early meeting of the Society.

Diversion of the Upper Course of the Periyar River, South India.—The project—discussed at various times from 1808 onwards, but only put into execution in 1887 upon plans prepared by Colonel Pennycuick—for diverting the upper course of the Periyar from its normal direction towards the west coast, and carrying it across the watershed to the opposite side of the peninsula, has lately



DIVERSION OF THE UPPER PORTION OF THE PERIYAR RIVER.

On Akik as a Future Trade-Centre.—At the Ipswich meeting of the British Association, a paper was read on the "Port of the Upper Nile in Relation to the Highways of Foreign Trade," by Mr. James Turnbull Playfair Heatley. He proposed the introduction of the term "nodality" for a commercial centre on a through line of trade, in accordance with a suggestion of Mr. Mackinder's in 1889. He then discussed the relative merits of Alexandria, Sawakin (with Sheikh Barud), Massawa, Mombasa, Tanga, and Chinde, as ports with their respective trade routes, and stated the case for Akik. He stated that the port of Akik is on the best bay of the Red Sea, and that a line of railway from Akik to Khartum by way of Goz Rejeb is the best route to bring Khartum and the Upper Nile into commercial relations with the maritime highways of trade. As the merits of different routes are decided by the importance of the nodalities which feed the highway of trade, he pointed out that the trade of the Habab and the Hagar districts would come to Akik. The important district of Tokar has been described as the granary of the Eastern Sudan, and is recognized as its key strategically. Here would also come the trade of the Beni Amr tribes from the valleys of the Anseba and the Baraka. At Filik there is the fertile district of the Gash. From Filik a line of some 50 miles to Kasala would tap the provinces of Taka, Gadarif, Galabat, and Senaar. As soon as a line is made to Goz Rejeb, the port of Akik would be in direct communication with the Upper Nile from June to September, during which time the Atbara and the Nile at the Sixth Cataract are navigable. From Akik to Goz Rejeb the distance is from 260 to 280 miles; the highest part of it is 1650 feet, with easy grading and no difficulties. To Goz Rejeb as a nodality, where routes meet from all parts, the trade of the Upper Nile, of Darfur and Dongola, can come by ship and caravan. But the importance commercially and strategically of Khartum demands the line from Goz Rejeb, a distance of some 180 miles. From Khartum the Nile, with some of its tributaries, is navigable for some 1500 to 1700 miles. The Blue Nile is navigable for 350 miles; the Sobat for 150 to 300 miles; the Bahr el Ghazal for 400 miles; the Bahr el Arab for 500 miles. The Nile itself—the Bahr el Abiad and the Bahr el Jebel—is navigable from Khartum to Kiri, a distance of 1068 miles. From Kiri, which is a fine district, and its Nile port, an important nodality, a line of some 50 miles to the mouth of the Unyama would bring the trade by ship from the lands in the basin of the Bahr el Jebel, the Victoria Nile, the Albert lake, and the Albert Nile. From the mouth of the Unyama a line might be made up the valley for some 50 miles to Fatiko, which is a fine district, and from Fatiko to Fauvera, some 70 to 80 miles, whence the Victoria Nile is navigable to Urondogani, some 160 to 180 miles. Thus Mr. Heatley considers that there is a feasible highway of trade from Usoga, Unyoro, and Uganda, and most of Kitara to Akik, as the port of the Upper Nile.

AMERICA.

Early French Explorations in the Interior of Guiana.—M. Henri Froidevaux, secretary to the Bureau Colonial près la Faculté des Lettres de Paris, has contributed to the *Bull. de Géog. historique et descriptive* (1894) an account of several entirely forgotten French journeys in the interior of Guiana made between 1720 and 1742, and this account has recently been republished in a separate form (Paris: Imprimerie Nationale, 1895). His attention was first drawn to some of these journeys by the discovery of a manuscript in the National Library, and further discoveries in the same library and in the French colonial archives made him acquainted with other journeys, and enabled him, in some cases, to determine the routes with more or less exactness. Where this has been found possible, he has furnished sketch-maps of the routes based on M. Coudreau's map of French Guiana in the *Bull. Soc. Géog.*, 4^e trimestre, 1891. The authorities on which his accounts are based are published in an appendix. The first of these journeys—Oct.-Nov., 1720—was due to the initiative of the colonial governor, Captain Claude de Guillouet, seigneur d'Orvilliers, its object being the discovery of certain gold mines reported by Indians. This journey was fruitless, but a subsequent journey led to the discovery, near the sources of the Oyapok, of a forest about ten leagues in extent, consisting almost exclusively of cacao trees, and this became the object of several other journeys, made with the encouragement of the colonial government. In one of these the explorer appears to have reached as far south as the Falls of Despair, on the Yari (Amazon basin). These journeys in quest of the cacao forest were ultimately given up on the part of the government, owing to the failure of the attempts to find a sufficiently easy route to bring down the produce of the forest in large quantity; but it would appear, from sundry notices, that down to 1735 private individuals continued to visit the region to collect small quanties of cacao. One interesting discovery was made in the course of one of these early journeys that had another object. Some Indians having reported that at the falls of the Oyapok, about the place where the river begins to be navigable, five or six days' journey above the confluence of the Camopi, the rocks are all covered with *caracoli*—a name which the Indians apply to both gold and silver—the governor sent out an expedition to determine the truth of this report; but the leader of the expedition found, on reaching his destination, that this so-called caracoli was nothing else than leaves of talc scattered all over the rocks. In this M. Froidevaux finds a confirmation of the explanation furnished by M. Crevaux ("Voyage en Guyane, 1877," *Bull. Soc. géog.*, 1878, pp. 413, 414) of the legend of Eldorado, which he believes to be based on the existence of caves of micaceous rocks, the Indians in their fantastic narratives confounding scales of mica with gold.

Gravity Measurements in the United States.—Mr. G. K. Gilbert has contributed to the *Bull of the Philosoph. Soc. of Washington* (vol. xiii.) a paper on the results of a transcontinental series of gravity measurements by G. R. Putnam, made in 1894. The observations were made at twenty-six stations, eighteen of which follow one another at fairly systematic intervals along the 39th parallel as far west as Salt Lake City. The general result is to show that the value of gravity is large on the sea-coast as compared with the interior.

Discovery of a Large River in Canada.—We learn that Dr. R. Bell, of the Canadian Geological Survey, in the course of his exploration of the land lying south and east of James bay, the southern extremity of Hudson bay, found that the whole district is the basin of a large river, which was not previously known. The river-basin extends from the watershed of the Upper Ottawa in 48° N. to James bay in 51° 30′, and its range in longitude is from 74° to 80° W. It is practically covered with continuous forest. The river, which flows in a north-north-westerly direction for about 250 miles, and receives three great tributaries from the east, is navigable for steamers for a considerable distance. A full account of Dr. Bell's interesting journey across the largest blank space in the map of Southern Canada will shortly be published.

AUSTRALASIA AND POLYNESIA.

Explorations in Central Borneo in 1893 and 1894.—In 1893 the Amsterdam Society for the promotion of scientific investigations in the Dutch colonies organized an expedition for explorations principally in Central Borneo. The scientific members were J. Büttikofer, conservator of the Royal Museum for zoology at Leiden; A. Hallier, assistant in the Herbarium of the Botanical Gardens at Buitenzorg; Dr. G. A. F. Molengraaff, professor at the University of Amsterdam, as geologist; and Dr. A. W. Nieuwenhuis, military surgeon in the Dutch Indian army, representing medicine, anthropology, and ethnography. The members of the expedition made their arrangements independently of each other, the zoologist staying at various stations for a considerable time at each, the botanist changing his stations more frequently, the anthropologist visiting the scattered settlements of the Dayaks, while the geologist travelled over as much ground as possible, making use of the rivers so far as he could to reach favourable points for observation in the mountains. The results of the exploration are to be published in a collected form by the organizing society; but meanwhile Dr. Molengraaff has contributed to *Petermanns Mitteilungen*, 1895, No. ix., a summary account of the geological survey. His first important station was at Nanga Raun (that is, "Raun-mouth") on the Mandai, a left-bank tributary of the upper Kapuas. This is in the midst of a picturesque region of wild tablelands and mountains to the south of the headwaters of the Kapuas, composed of terraces of volcanic tuffs, and eroded here and there into a number of isolated peaks. These mountains stretch from west 10° south to east 10° north, to the boundary of West Borneo (about 114° east), and have been named by Dr. Molengraaff the Müller mountains, in memory of Georg Müller, an explorer who had reached this region from the east (the Mohakkam basin), and was killed here early in 1826. The Seberuang, a left-bank tributary of the Kapuas lower down, was next visited, and here some fossils of Cretaceous age were found for the first time in Borneo. Then, passing to the north of the Kapuas, Dr. Molengraaff visited a group of *danaus*, or inundation lakes, which, when the waters are at a medium height, form a continuous sheet of water about 60 square miles in extent; in drier periods become converted into a number of lakes connected by numerous channels or swampy tracts; and in very dry seasons, once every two or three years, get dried up almost entirely. Thence he proceeded further north to the mountains bordering on Saráwak. These mountains were afterwards visited further east. They are described as a true mountain system formed by folds of the earth's crust, rising abruptly on the Dutch side from the plain, and having a mean trend of west 5° south to east 5° north, and increasing in width and height towards the east. In the western part clay-slates with innumerable quartz veins predominate; in the eastern, flint, siliceous slates, and sandstones. Dr. Molengraaff proposes to call these mountains the Upper Kapuas Fold-mountains (*Faltungsgebirge*). They are entirely without human settlements. The only inhabitants are wandering Dayaks, locally called Bukats, and also known as Punans. Dr. Molengraaff's last journey was southwards by a route crossing a plateau to the south of the Müller mountains (Madih plateau), to the mountains which separate West from South-West Borneo. There he ascended the Bukit Raya, the highest peak as yet known in Dutch Borneo (7475 feet). These mountains he proposes to call, in honour of C. A. L. M. Schwaner, a traveller who visited them in 1848, the Schwaner mountains—if, he says, the name of mountains can be given to an elevated strip rising above the adjoining country on both sides, and crowned by rounded summits, ridges, and peaks, but forming in reality the edge of a plateau sloping gently towards the north. The water-parting between the basin of the Kapuas and that of the Kitangan was crossed to the east of the Bukit Raya, and the Samba, a northerly tributary of the Kitangan, was ultimately reached. The Samba is a considerable stream, not less than 150 feet broad, traversing a hilly country composed of granite, said to be mostly covered with primeval forest, and of great fertility. The Kitangan winds lazily through a swampy country, yielding little for the geologist. The report is accompanied by a map on the scale of 1: 2,000,000, showing Dr. Molengraaff's routes. This map, it is said, may be depended on for the accuracy of the river-courses, these being laid down in accordance with the data obtained by the topographical brigade of the Dutch-Indian army in the survey begun in 1886, and now approaching its completion.

Meteorological Observatory on Mount Wellington, Tasmania.—Mr. Clement L. Wragge, the enthusiastic mountain meteorologist to whose efforts the establishment of a meteorological station on Ben Nevis is due, had the satisfaction of opening an observatory hut on Mount Wellington, near Hobart, on June 30. The summit of this mountain is 4000 feet above sea-level, and the observations at the top will be simultaneous with those at a sea-level station, so that in position it is an exact analogue of Ben Nevis. The hut which has been erected is, in the mean time, intended merely as a shelter for an observer who ascends periodically; but it is hoped that arrangements will be completed by which regular hourly observations may be taken. The newspaper account from which we take our information gives a clear idea of the value of this site to meteorology: "The great value of Ben Nevis lies in the fact that the mountain lies directly in the track of Atlantic storms, precisely as Mount Wellington lies in the direct track of the Antarctic V-shaped disturbances which produce the heaviest gales and most stormy weather on the southern seaboard of Australia and around Tasmania. Mr. Wragge established the Ben Nevis observatory in 1881, and its value has been clearly shown in the *Transactions of the Royal Society of Edinburgh*. Dr. Buchan's remarks in that regard apply, Mr. Wragge asserts, with almost equal force to Mount Wellington as the most valuable sister observatory in this hemisphere. Mr. Wragge is convinced that if hourly observations could be secured at Mount Wellington and Hobart, and be placed side by side with similar observations at Ben Nevis and its collateral low-level station at Fort William, results would be forthcoming of the greatest possible value to meteorologists and students of physical science in every part of the world."

POLAR REGIONS.

Proposed German Antarctic Expedition.—Our Berlin correspondent informs us that at the meeting of the German Antarctic Committee on November 3, it was decided to make an effort to combine the schemes of the projected German Antarctic expedition and the Austrian artistic polar expedition, proposed by Herr von Payer, in a joint German-Austrian expedition to the Antarctic regions. For this purpose it was resolved to endeavour to bring together a fund of about £50,000 for the purchase and equipment of the necessary ships. The result of the effort will be awaited with interest. The report published in several English newspapers, that the money had already been secured, is unfounded.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Theory of Deserts.—In the *Annales de Géographie* for October, 1895, Professor de Lapparent discusses the origin and essential characteristics of deserts. He shows how they are due in every case to the control exerted by the primitive land-form on the precipitation or on the drainage of rainfall. In the case of depressions, especially those below sea-level, the air, heated thermo-dynamically by its descent into them, has acquired the capacity of taking up more water-vapour, and consequently evaporation is stimulated and precipitation checked. Again, at great elevations the low temperature separates the water-vapour from the air in the solid form, and so prevents the formation of rain. The control of drainage is still more interesting, and its results in a great measure have not been recognized hitherto. Calcareous rocks and surface soil of great porosity remove water so rapidly from the surface that streams cannot establish themselves or produce their typical modelling of the surface. In depressions the effect of evaporation prevents the formation of a permanent base-level, and the establishment of stream-lines becomes difficult, while wind-borne sand tends to accumulate and divert rivers, splitting them into many shallow channels, on which evaporation acts rapidly. These conditions tend to intensify themselves, and any revolution of the land-surface which interrupts the typical slope from watershed to sea favours the formation of an arid area. M. de Lapparent draws the general conclusion that the desert type is always due to the powerlessness of fluvial erosion, and that in consequence the desert land-forms are characteristically incomplete, the normal land-modelling agencies having been prevented from finishing their work.

Origin of the Loess in China.—The remarkable formation known as loess, which extends for about one million square miles in the Chinese Empire, is of special geographical interest, on account of the influence it exerts on all the surface features of the region where it is found. Baron Richthofen's theory that the loess originates from wind-borne dust carried from the arid interior and brought to the ground by the increasing moisture of the atmosphere, has been for some time in competition with the suggestion that the deposit is of fluvio-glacial origin. Messrs. Skertchly and Kingsmill have recently studied the surface formations in Shan-tung, and the last number of the *Quarterly Journal of the Geological Society* (vol. 51, p. 238) contains a paper in which they bring forward a new theory. They argue, that since Northern and Eastern Asia have not been subjected to the same sort of glaciation as Europe, therefore loess is in no way connected with glacial action. Where undisturbed, this formation shows plain marks of stratification; and as the authors reject the theory of æolian origin, and find enormous difficulties in assuming it to be a fresh-water sediment, they have "been driven to ascribe to it a marine origin." They point out that it has been subject to enormous denudations and rearrangement, and that it is succeeded by extensive marine sands and old valley gravels. They farther find that zoological, ethnological, historical, and traditionary evidence points to the former depression of Asia beneath the sea, and the subsequent desiccation of the land after re-elevation. The evidence brought forward in support of these conclusions did not appear to be accepted as complete by the geologists who discussed the paper. Here, therefore, is a field in which travellers in China and Central Asia may hope to find, by careful observation, the material for interesting theoretical conclusions. The finding of undoubted sea-shells in inland loess would be a very strong piece of evidence.

The Intellectual Value of Physical Geography.—Mr. Albert Peny Brigham contributes to the last number of the *Bulletin* of the American Geographical Society, an interesting paper on the "Composite Origin of Topographic Forms." He shows that in the classification of land forms by a genetic standard, it is not enough to look at one cause as sufficient to account for the present form of a land surface, because several agencies simultaneously at work have had a share in producing the final result. Although he is inclined to view this method of classification, so strongly upheld by Professor W. M. Davis in America, as one of considerable difficulty, he is very strongly convinced of its value, both from the scientific and the educational points of view. He sums up, "The teacher of Physiography has no greater reward than is his when a student assures him that henceforth his native state will be to him a new country, or that he shall see the hills and valleys of his old home with new eyes. This is precisely because he has learned to interpret the forms in the light of their origin; to read the work of the frost, the rain, and the plant; to measure the achievement of the river, with perception of its past and prophecy of its future; or to see where the glacier has traced its unmistakable inscription. Every journey becomes fraught with meaning, and the traveller who has caught the spirit of modern geography will not report the great plains of Kansas and Nebraska as 'uninteresting.' It must, however, still be said that many colleges deny their graduates this appreciative eye. But even the secondary and earlier grades cannot much longer deprive their pupils of this best fruit of geographic study."

The Areas of Land and Sea.—Professor Hermann Wagner has lately made a re-calculation of the area of the different land-masses of the globe, and discussed the results in various ways, which will be described in full in Professor Gerland's *Beiträge zur Geophysik*. A preliminary announcement was made in the *Scottish Geographical Magazine* of April last, with special reference to the work of Dr. Murray published in that journal. The total area of land, making certain assumptions as to the probable proportion of land and sea in the unknown polar regions, was given by Dr. Murray in 1886 as 55,697,400 square miles, and Professor Wagner's new result is 55,814,000 square miles; in other words, the two estimates are practically identical. The difference comes when the distribution of the land in latitude is considered. Professor Wagner availed himself of the determinations of the area of the various continents by Strelbitski, Wisotzki, and Trognitz, after testing the work in each case, and he finally checked his results in a singularly neat and satisfactory way. He took the areas of the ocean in different zones of latitude as worked out by Dr. Karstens in the course of his recent calculations of the mean depth of the oceans (see *Geographical Journal* for September, vol. vi. p. 267), and, deducting these from the mathematically calculated areas of the zones of the spheroid, obtained the area of the land by difference. The two sets of figures agreed very closely, but in some cases they deviated rather widely from Dr. Murray's results. Professor Wagner concludes with the following estimate of the proportions of land and sea in the different zones:—

Latitude	80°–70° N.	70°–60° N.	60°–50° N.	50°–40° N.	40°–30° N.	30°–20° N.	20°–10° N.
Percentage Land	28·8	71·4	56·9	52·3	42·8	37·6	26·3
Percentage Sea	71·2	28·6	43·1	47·7	57·2	62·4	73·7

Latitude	10° N.–0°	0°–10° S.	10°–20° S.	20°–30° S.	30°–40° S.	40°–50° S.	50°–60° S.
Percentage Land	22·8	23·6	22·1	23·1	11·4	3·2	0·8
Percentage Sea	77·2	76·4	77·9	76·9	88·6	96·8	99·2

The final ratio of land to water for the whole globe is 1 : 2·54.

Survey of Glaciers by Photography.—Mr. Otto J. Klotz describes in the *Journal of Geology* (vol. 3, p. 512), the method he adopted, while with the Canadian surveying party on the Alaska Boundary expedition, for studying the Baird Glacier photographically. By using a horizontal camera of fixed focal length, provided with points of reference which appear in each picture and serve to fix the horizon of the camera, and photographing the face of the glacier from the ends of a measured base at a measured distance from the glacier, it was possible to make a complete map of the glacier so far as it was visible both in its horizontal and its vertical extent. The work was so accurate that, by taking photographs from the same standpoint at a comparatively short interval of time, all the changes in the glacier due to surface melting and to onward flow could be detected and measured. Thus between July 13 and August 11, 1894, an interval of twenty-nine days, the ice-front was lowered 2·1 feet by melting, and had advanced 29 feet, or at the rate of one foot per day.

OBITUARY.

Dr. Robert Brown.

Dr. Robert Brown, whose sudden death on October 26 deprived the Society of a Fellow of thirty years' standing and a member of Council, was perhaps the most widely known exponent of popular geography of the present generation. He approached geography from the side of natural science, his special study having been botany. To distinguish his writings from those of his celebrated namesake, Dr. Robert Brown of Montrose, he designated himself "Campsterianus," from the little estate of Campster, in Caithness, where he was born in 1842. He studied at the University of Edinburgh, where he took the degree of M.A., and afterwards at Leiden, Copenhagen, and Rostock, from the last of which universities he afterwards received the degree of Ph.D. Being of an adventurous disposition, he went out to British Columbia, and was in command of an exploring expedition sent to open up Vancouver island in 1864, the printed report of which in the Society's library contains a series of unpublished sketches by the author. After extensive travels through British North America, he took part in Mr. E. Whymper's expedition to the west coast of Greenland in 1867, taking charge of the natural history collections, and he also devoted attention to the glaciers. From his observations on the vast masses of inland ice in Greenland, he obtained the strong convictions on the erosive power of ice which he expounded and defended in the papers published in vols. xxxix. and xli. of the *Journal* of this Society, and which he retained to the last. After a few years spent in Glasgow and Edinburgh, engaged in literary work, and for some time as a lecturer in the School of Arts, now the Heriot-Watt College, Dr. Brown came to London in 1876. For the last twenty years of his life he was engaged mainly in journalism and in the preparation of popular works, most of which were published in a serial form by Messrs. Cassell and Co. These included the 'Peoples of the World' in six volumes, 'The Countries of the World' in six volumes, 'Science for all' in five volumes, 'Our Earth and its Story' in three volumes, and 'the Story of Africa' in three volumes. In these Dr. Brown had not an opportunity to exercise his full powers; some of the books were adaptations from foreign works, and others compilations. They have proved popular, and have undoubtedly done much to disseminate the results of geographical science, if not to advance geographical thought. His more important works include a 'Manual of Botany,' a number of papers embodying his early researches and observations published in *Petermann's Mitteilungen* and the Transactions of various societies (up to 1883 the Royal Society Catalogue records 44 titles), and the 'Bibliography of Morocco,' in which he collaborated with Sir R. Lambert Playfair. For many years Dr. Brown spent his holidays in visiting the Barbary States, and the study of the history and bibliography of the Mediterranean border of Africa was a continual delight to him. The work was published in the last volume of the 'Supplementary Papers' of the Royal Geographical Society. Dr. Brown had completed the work of editing a new edition of Pary's 'Leo Africanus' for the Hakluyt Society, with an introduction and elaborate notes. At the time of his death he was actively engaged in passing the work through the press. In private life he was genial and kindly. He was fond of talk with intimate friends, and his conversation was remarkably copious, easy, and entertaining, full of anecdote and incident derived from his years of travel in all latitudes, and of rare and curious and often out-of-the-way knowledge, in which his early predilection for botany often reappeared. In nothing did he show himself more amiable than in his readiness to help others in any way he could. The reply to any request for information on any subject to which he applied himself, was sure to be prompt and full, and the same promptitude was shown in rendering any other service which it was in his power to do.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1895-1896.

First Ordinary Meeting, November 11, 1895.—Clements R. Markham, Esq., C.B., F.R.S., President, in the Chair.

Opening Address by the President.

The Paper read was:—

"Progress of the Jackson-Harmsworth Arctic Expedition." By Arthur Montefiore, F.G.S.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. R. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Alpine Lakes. *Petermanns M.* 41 (1895): 225-233. **Halbfass.**

Tiefen- und Temperaturverhältnisse einiger Seen des Lechgebiets. Von Dr. W. Halbfass. *With Map.*

A note on Dr. Halbfass's work will appear in the Monthly Record.

Alps—Mont Blanc. *C.R.* **121** (1895): 477-483. **Janssen.**

Sur une ascension au sommet du Mont Blanc et les travaux exécutés pendant l'été de 1895 dans le massif de cette montagne. Note de M. J. Janssen.

This will be referred to in the Monthly Record.

Europe—Climate and Prices. *G.Z.* 1 (1895): 39–51, 100–108. **Brückner.**
Der Einfluss der Klimaschwankungen auf die Ernteerträge und Getreidepreise in Europa. Von Prof. Dr. Eduard Brückner.

Europe—Steppes. *G.Z.* 1 (1895): 152–163. **Nehring.**
Die Ursachen der Steppenbildung in Europa. Von Prof. Dr. A. Nehring in Berlin.

France—Loire. *Ann. G.* 5 (1895): 108–111. **Gallouédec.**
Mémoire inédit de Lavoisier sur la navigabilité de la Loire. Par M. L. Gallouédec.

France—Lot. *C.R.* 121 (1895): 576–578. **Martel.**
Sur de nouvelles observations dans le gouffre de Padirac (Lot). Note de M. E.-A. Martel. *With Plan.*

France—Lot. **Martel.**
Le Gouffre de Lantouy (Lot). Extrait du Bulletin de la *Société Scientifique, Historique et Archéologique de la Corrèze* (siège à Brive), tome xvii. Par E.-A. Martel. Size 10 × 6½, pp. 7. *Presented by the Author.*

France—Lot. **Martel.**
E.-A. Martel. Le Refuge de Roc de Gorp (ou d'Ancor) sous l'oppidum de Murcens (Lot). Brive: Imp. Roche, 1895. Size 10 × 6½, pp. 12. *Illustrations. Presented by the Author.*

France—Normandy and Brittany. **Hare.**
North-Western France (Normandy and Brittany). By Augustus J. C. Hare. London: G. Allen, 1895. Size 8 × 5½, pp. 410. *Map and Illustrations. Price* 10*s.* 6*d. Presented by the Publisher.*

Mr. Hare's Guidebooks to France are particularly adapted for the use of persons interested in architecture and in the historical associations of places. This volume, like those which preceded it, may be read with interest by others than tourists. It abounds in long French quotations, and a few of the hints to travellers are somewhat obscure; for example, of one hotel we read, "Very good, but *horrors*."

France—Rhone, etc. **Bourdon.**
B.S.G. Paris 15 (1894): 70–95; 16 (1895): 75–111, 219–265.
Le Cañon du Rhône et le Lac de Genève. Par G. Bourdon.

France—Rivers. *Ann. G.* 5 (1895): 25–49. **Davis.**
La Seine, la Meuse, la Moselle. Par M. W. M. Davis. *With Maps.*

This treatment of French rivers by Professor Davis is similar to his discussion of the rivers of the South of England in the *Geographical Journal*, vol. v. p. 127 (1895).

France—Vosges. **Delebecque.**
Les lacs des Vosges. Par [M. André Delebecque]. Extrait des Comptes rendus de la Société de Géographie (Séance du 21 juin 1895). Size 9 × 6, pp. 6. *Presented by the Author.*

Germany—Saxony. **Wittstock and Scheiner.**
Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Neunter Band. Heft 2. Volkstümliches der Siebenbürger Sachsen, von O. Wittstock. Die Mundart der Siebenbürger Sachsen, von Dr. A. Scheiner. Stuttgart: J. Engelhorn, 1895. Size 9½ × 6½, pp. [138]. *Plates.*

Germany—Silesia. **Partsch.**
Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Neunter Band. Heft 3. Die Regen Karte Schlesiens und der Nachbargebiete, entworfen und erläutert von Dr. Joseph Partsch. Stuttgart: J. Engelhorn, 1895. Size 9½ × 6½, pp. [40]. *Map.*

Germany—Southern. **Baedeker.**
Southern Germany, including Wurtemberg and Bavaria. Handbook for Travellers. By Karl Baedeker. With 16 Maps and 15 Plans. Eighth Revised Edition. Leipsic: Karl Baedeker; London: Dulau & Co., 1895. Size 6½ × 4½, pp. xxviii. and 266. *Price 5 marks. Presented by Messrs. Dulau & Co.*

Gibraltar. *Nineteenth Century* (1895): 814–827. **Adye.**

The Past and the Future of Gibraltar. By Lieut.-Col. John Adye. *With Map.*

The map shows the proposed harbour on the west side of the rock of Gibraltar, and the article describes the projected works with reference to previous projects of a similar kind.

Iceland—Ice-mountains. *G. Tidskrift* 13 (1895): 56–60. **Thoroddsen.**

Et to Hundrede Aar gammelt Skrift om islandske Jøkler. Af Dr. phil. Th. Thoroddsen.

An account of the literature bearing on the ice-mountains and glaciers of Iceland in the seventeenth century.

Mediterranean. **Cavan.**

With the Yacht, Camera, and Cycle in the Mediterranean. By the Earl of Cavan, K.P. London: Low & Co., 1895. Size 8 × 5½, pp. xvi. and 94. *Illustrations. Price* 12*s*. 6*d*. *Presented by the Publishers.*

This is a practical guide to the Mediterranean yachtsman written in the best possible style, as the simple narrative of an actual cruise, with hints and suggestions to others who may follow at every point. There are nearly a hundred photographs, all good and serviceable in giving an idea of the chief Mediterranean harbours such as the yachtsman wants and cannot get from the charts. It is incredible that Lord Cavan never saw a cloudless sky on his trip, yet every photograph shows clouds, sometimes of great density, though the shadows are sharp as if the sun were brilliant. If these clouds be the work of the reproducers, it robs the series of much of their geographical value.

Rumania. **Richard.**

La Roumanie à vol d'oiseau. Hydrologie, géologie, richesses minérales, eaux minérales, pétrole, etc. Par A. de Richard. Bucarest: J. Göbl Fils, 1895. Size 9½ × 6½, pp. 424. *Plates. Presented by the Author.*

Books on Rumania in the languages of Western Europe are rare, and hence M. de Richard's description of the mineral wealth of the country will prove of great utility.

Russia. *B.S.G. Marseille* 18 (1894): 242–264; 19 (1895): 277–283. **Saint-Yves.**

Le Connaissance Géographique de la Russie en France du XVIe au XIXe Siècle. Par M. G. Saint-Yves.

Russia—Finland. ———

Exposé des Travaux Géographiques exécutés en Finlande jusqu'en 1895. Communication faite au Sixième Congrès International de Géographie, à Londres, 1895, par la Société de Géographie de Finlande. Helsingfors, 1895. Size 10 × 7, pp. 154.

This will be referred to in the Monthly Record.

Sweden—Stockholm. **Wittmann.**

Wegweiser des Schwedischen Touristenvereins, No. 10. Stockholm, die Hauptstadt Schwedens. Aus dem Schwedischen übertragen von Reichsarchivrath Dr. P. Wittmann, München. Stockholm, Wahlström and Widstrand [1895]. Size 7 × 10, pp. 150. *Illustrations. Presented by the Publishers.*

Turkey—Macedonia. **Naumann.**

Macedonien und seine neue Eisenbahn Salonik-Monastyr. Ein Reisebericht von Dr. Edmund Naumann. Munich and Leipzig: R. Oldenbourg, 1894. Size 10 × 7, pp. 58. *Map. Presented by the Author.*

An account of the author's travels in Asia Minor in connection with the construction of the Salonika-Monastir railway.

United Kingdom—England—Devon. **Murray.**

A Handbook for Travellers in Devon. Eleventh Edition. With Maps and Plans. London: John Murray, 1895. Size 7 × 4½, pp. [42], 292, and 16. *Price* 7*s*. 6*d*. *Presented by the Publisher.*

The revision of this handbook has been thorough, and the work is equipped with an entirely new set of maps and plans. The sectional map of Devonshire coloured in contours, by Bartholomew, gives an admirable view of the physical features of the country, and elucidates the sites of the towns and villages.

Captain Rochus Schmidt had considerable experience in command of the German troops in East Africa. He gives in this volume the history of German East Africa, and a short account of its physical and economic condition.

Madagascar. **Paisant.**

Marcel Paisant. Madagascar. Deuxième Édition. Paris: Librairie Larousse [not dated: 1895]. Size 10 × 6½, pp. 144. *Map and Illustrations.*

This little book gives very compactly an account of the geography, fauna and flora, ethnography, political and social institutions, history, and exploration of Madagascar. The last section is accompanied by sketch-maps of the routes of the principal travellers. The neighbouring French islands—Diego-Suarez, Sainte-Marie de Madagascar, Nosybé, and the Comoros—are briefly described.

Mauritius. *Q.J. Geological S.* **51** (1895): 463-471. **Haig.**

The Physical Features and Geology of Mauritius. By Major H. de Haga Haig. *With Map.*

A note summarizing the results of this paper appeared in the *Geographical Journal*, vol. v. (1895), p. 597.

Sudan—Adamaua. **Passarge.**

Adamaua. Bericht über die Expedition des Deutschen Kamerun-Komitees in den Jahren 1893-94. Von Dr. Siegfried Passarge. Berlin: D. Reimer, 1895. Size 11½ × 8, pp. xvi. and 574. *Portrait, Maps, and Illustrations. Presented by the Publisher.*

This work will be specially noticed.

NORTH AMERICA.

British North America—Labrador. **Bryant.**

A Journey to the Grand Falls of Labrador. By Henry G. Bryant. Reprint Geographical Club—Bulletin No. 2 [Philadelphia, 1894]. Size 9½ × 6, pp. 48. *Maps and Plates. Presented by the Author.*

Canada—Quebec. *P. and T.R.S. Canada* **12**, 1894 (1895): 63–70. **Laflamme.**

L'Eboulis de St. Alban. Par Mgr. Laflamme. *With Sections.*

Account of a great landslip in April, 1894, by means of which the course of a river was completely changed. A plan of the old and new river-courses, with sections showing the structure of the country, illustrate the memoir.

Canada—Sable Island. *P. and T.R.S. Canada* **12**, 1894 (1895): 3–49. **Patterson.**

Sable Island: Its History and Phenomena. By the Rev. George Patterson, D.D. *With Map.*

This memoir contains (1) a Description of the island; (2) Notices by early voyagers, 1500–1600; (3) Notices from the removal of La Roche's colonists till the establishment of the first life-saving station, 1601–1801; (4) First relief establishment on the island, 1801–1809; (5) History of relief establishment, 1809–1848; (6) Life on the island, 1848–1855; (7) To the present time, 1855–94; (8) Physical history of the island, and its probable future. As an appendix, a list of 191 ships wrecked on Sable island since 1801 is given.

United States—Triangulation. **Gannett.**

Results of Primary Triangulation. By Henry Gannett. Bulletin of the United States Geological Survey, No. 122. Washington: Government Printing Office, 1894. Size 9 × 6, pp. 412. *Plates. Presented by the U.S. Geological Survey.*

The triangulation carried out by the U.S. Geological Survey during the last twelve years was for the purpose of controlling the 1-inch topographical map, and no higher accuracy was aimed at.

United States—Washington. *B. American G.S.* **27** (1895): 239-255. **Bogue.**

Stampede Pass, Cascade Range, Washington. By Virgil G. Bogue. *With Map and Illustrations.*

Account of the adventurous expedition across the Cascade Mountains in 1880 while looking for a practicable route by which the Northern Pacific Railway could cross the range.

CENTRAL AND SOUTH AMERICA.

Brazil—Bahia. **Vianna.**

Memoir of the State of Bahia, written by the order of the Right Honourable Governor of the State of Bahia, Dr. Joaquim Manuel Rodriques Lima, by the Director of the Public Archives, Dr. Francisco Vicente Vianna, assisted by . . . José Carlos Ferreira. Translated into English by Dr. Guilherme Pereira Rebello. Bahia: Office of the "Diario da Bahia," 1893. Size 9 × 6, pp. 682 and xxviii. *Presented by the Governor of Bahia.*

A work prepared for the Chicago Exhibition.

British Guiana—Roraima. *Timehri* 9 (1895): 107–188. **Quelch.**

A journey to the Summit of Roraima. By J. J. Quelch.

Mr. Quelch, with several friends, experienced no difficulty in reaching the summit of Roraima, and would have remained there several days but for their native carriers, who insisted on leaving at once. Good photographs of the summit were obtained, and some collections made of birds and plants from the rugged plateau.

Central America—Archæology. **Maudslay.**

Biologia Centrali-Americana; or Contributions to the Knowledge of the Fauna and Flora of Mexico and Central America. Edited by F. Ducane Godman and Osbert Salvin. Archæology. By A. P. Maudslay. [Part V., July, 1895.] (Vol. III. pp. 1–24.) London: R. H. Porter and Dulau & Co. Size 13 × 10½. *Illustrations. Plates I.–XXV. (separate)*, size 13 × 20½.

This instalment gives an account of the ruins of Chichen Itra, in Yucatan. The map of Yucatan, which prefaces the accompanying plates, contains some additions by the author.

Guiana. *Timehri* 9 (N.S.) (1895): 1–20. **Rodway.**

Some Spanish Accounts of Guiana. By the Editor [James Rodway].

Timehri is recalling to the colonists of British Guiana the stirring times of the early history of the country. In addition to Mr. Rodway's account of the Spanish explorers, the present number contains a long extract from Purchas' *Pilgrimes* on Captain Leigh's first settlement in 1604.

Sarmiento's Voyages. **Markham.**

Narratives of the Voyages of Pedro Sarmiento de Gambóa to the Straits of Magellan. Translated and Edited, with Notes and an Introduction, by Clements R. Markham, C.B., etc. [Hakluyt Society Publications, No. XCI.] London: Printed for the Hakluyt Society, 1895. Size 9 × 6, pp. xxx. and 402. *Presented by the Hakluyt Society.*

The voyages of Sarmiento as here translated form a most fascinating chapter in the history of adventurous exploration, and they are enriched by a series of valuable notes and an introductory biography of the voyager, which greatly heighten the interest of the whole.

AUSTRALASIA AND PACIFIC ISLANDS.

Australia—Physical Geography. **Thomson.**

P. and T. Queensland Br. R.G.S. Australasia 10 (1895): 85–131.

Presidential Address—The Physical Geography of Australia. By J. P. Thomson.

Mr. Thomson appends to his paper a number of statistical tables relating to mountains, rivers, etc., which cannot fail to be useful for reference.

New South Wales—Broken Hill. *Contemporary Rev.* (1895): 358–362. **Frewen.**

A Visit to Broken Hill. By Moreton Frewen.

This paper incidentally contains an interesting comparison between the physical and economic conditions of New South Wales and California.

New Zealand. **Smith.**

Report of the Department of Lands and Survey, New Zealand, for the year 1894–95. By Stephenson Percy Smith. Wellington, 1895. Size 13½ × 8½, pp. xvi. and 182. *Maps and Plates.*

New Zealand Alps. *Contemporary Review* (1895): 190–211. **Fitzgerald.**

In the New Zealand Alps. By E. A. Fitzgerald. *With Map.*

This paper deals with a journey, also mentioned in the *Alpine Club Journal* 17 (1895), 469–475.

New Zealand—Aorangi. *New Zealand Alpine J.* 2 (1895): 29–33. ——

The First Complete Ascent of Aorangi. A New Route from the Hooker side. Extracted from Mr. T. C. Fyfe's Account in the Otago *Daily Times* of February 21st, 1895.

The Second Ascent of Aorangi (Zurbriggen's).

South Australia. **Woods and Wilson.**

The Province of South Australia. Written for the South Australian Government by James Dominick Woods, with a Sketch of the Northern Territory, by H. D. Wilson. Adelaide: C. E. Bristow, Government Printer, 1894. Size 8¼ × 5¼, pp. 446.

Tasmania. **Walker.**

The Discovery of Van Diemen's Land in 1642; with notes on the localities mentioned in Tasman's Journal of the Voyage. By James Backhouse Walker. Hobart: W. T. Strutt, 1891. Size 8¼ × 5¼, pp. 16. *Presented by the Author.*

The Author advocates the restoration of the original names to some of the bays and headlands of Tasmania.

Tasmania and Norfolk Island. **Walker.**

The Deportation of the Norfolk Islanders to the Derwent in 1808. By James Backhouse Walker. I. The Settlement of Norfolk Island. II. The Deportation to the Derwent. Hobart, W. Grahame, jun., 1895. Size 8¼ × 6, pp. 26. *Presented by the Author.*

This is noticed in the Monthly Record.

POLAR REGIONS.

Antarctic Expedition. *Nineteenth Century* (1895): 706–712. **Markham.**

The Need for an Antarctic Expedition. By Clements R. Markham, C.B.

Antarctic Exploration. **Southwell.**

Antarctic Exploration (Illustrated). By Thomas Southwell. Reprinted from *Natural Science*, Vol. VI. No. 36, February, 1895. Size 10 × 6¼. *Presented by the Author.*

Antarctic Meteorology. *Petermanns M.* 41 (1895): 245–247. **Supan.**

Die meteorologischen Beobachtungen der "Antarctic" im Südlichen Eismeere. Von Prof. Dr. A. Supan.

The meteorological observations from the log of the "Antarctic" are here published with a brief discussion.

Arctic Ballooning. *C.R.* 120 (1895): 1199–1202. **Faye.**

Rapport sur le projet d'expédition en ballon aux régions polaires. De M. J. A. Andrée. (Commissaires: MM. Faye, Daubrée, Blanchard; Faye, rapporteur.)

Arctic Ballooning. *Verh. Ges. Erdk. Berlin* 22 (1895): 533–538. **Moedebeck.**

Die Polar-Forschung mittelst Luftballons. Von Hermann Moedebeck.

The result of this criticism of Mr. Andrée's proposed balloon journey is favourable to the probable success of the plan; but the unlikelihood of good scientific observations being possible in so short a period as is contemplated is pointed out.

Arctic Ballooning. **Baschin.**

Andrées Vorschlag einer Nordpolexpedition im Luftballon. Von Otto Baschin. (Sonderabdruck aus der Geographischen Zeitschrift, hrsg. von A. Hettner, I. Jahrgang, 1895.) Leipzig: B. G. Teubner. Size 10 × 6½, pp. 6. *Presented by the Author.*

Arctic Ballooning. *Rev. Scientifique* (4) 3 (1895): 753–755. **Rabot.**

Un projet d'exploration polaire aéronautique. Par M. Charles Rabot.

Arctic Ocean—Kara Sea. *J. Tyneside G.S.* 3 (1895): 123–126. **Wiggins.**

Lecture on the Kara Sea Navigation. By Captain Wiggins.

Arctic—Peary Auxiliary Expedition. **Bryant.**

The Peary Auxiliary Expedition of 1894. By Henry G. Bryant. With Supplementary Reports by Prof. T. C. Chamberlin (Geology), Dr.

Axel Ohlin (Zoology). [Reprint from *Bulletin of Geographical Club*, No. 5.] Philadelphia, 1895. Size 9½ × 6, pp. 78. *Maps and Plates. Presented by the Author.*

Mr. Bryant was in command of the expedition of 1894 for the relief of Mr. Peary.

Franklin's Arctic Expeditions. *Scottish G. Mag.* 11 (1895): 329–335. **Dalgleish.**

Notes on Franklin's Arctic Expeditions. By W. Scott Dalgleish. *With Map and Portraits.*

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Astronomy—Nebular Theory. **Stanley.**

Notes on the Nebular Theory in relation to Stellar, Solar, Planetary, Cometary, and Geological Phenomena. By William Ford Stanley. London: Kegan Paul & Co., 1895. Size 8½ × 6, pp. xvi. and 260. *Plates. Presented by the Author.*

While the greater part of this book deals with matters of astronomical speculation, the chapters on the Conditions of the Cooling Earth and on the Condition of Earth-Formation approach the geographical standpoint from which certain geological problems may legitimately be viewed.

Geological hypotheses. **Kuntze.**

Geogenetische Beiträge. Von Dr. Otto Kuntze. Leipzig: Gressner and Schramm, 1895. Size 9 × 6½, pp. 78. *Illustrations. Presented by the Author.*

This pamphlet contains several papers, the first suggesting that the Andes might have originated by a single oscillation of the Earth's crust, the second discussing denudation in deserts at the present time and in the Upper Carboniferous period, while others deal with the origin of saltpetre deposits, the fossilization of wood, and, at great length, with the origin of coal.

Mountains and Peoples. **Ratzel.**

Wissenschaftliche Veröffentlichungen des Vereins für Erdkunde zu Leipzig. Zweiter Band. Anthropogeographische Beiträge. Zur Gebirgskunde vorzüglich Beobachtungen über Höhengrenzen und Höhengürtel. Herausgegeben im Auftrage des Vereins für Erdkunde und der Carl Ritter-Stiftung zu Leipzig, von Friedrich Ratzel. Leipzig: Duncker & Humblot, 1895. Size 10 × 6½, pp. viii., 172, and 362*. *Maps and Plates.*

This will be referred to in the Monthly Record.

Oceanography—Baltic. **Credner.**

Gesellschaft Deutscher Naturforscher und Aerzte. Verhandlungen 1895. Allgemeiner Theil. Rudolf Credner. Ueber die Ostsee und ihre Entstehung. Vortrag gehalten in der 3 allgemeinen Sitzung der 67 Versammlung Deutscher Naturforscher und Aerzte in Lübeck am 20 Sept. 1895. Leipzig: J. C. W. Vogel, 1895. Size 9½ × 7, pp. 26. *Presented by the Author.*

This will be noticed in the Monthly Record.

Oceanography—Bay of Biscay. *B.S.G. Com. Bordeaux* **18** (1895): 297–317. **Hautreux.**

Golfe de Gascogne. Températures de la mer sur la côte des Landes et dans le Bassin d'Arcachon. Par A. Hautreux.

A note on this paper will appear in the Monthly Record.

Oceanography—Bay of Biscay. *B.S.G. Comm. Bordeaux* **18** (1895): 455–467. **Hautreux.**

Côte des Landes et bassin d'Arcachon; densités de la surface de la mer. Par A. Hautreux. *With Diagrams.*

This is noticed in the Monthly Record.

Oceanography—Challenger Voyage. **Murray.**

Report on the Scientific Results of the Voyage of H.M.S. *Challenger* during the years 1872–76, under the command of Captain Sir G. S. Nares, and the late Captain F. T. Thomson. Prepared under the superintendence of the late Sir C. Wyville Thomson, and now of John Murray. A Summary of the Scientific Results. 2 Parts (with Appendices). London:

Eyre & Spottiswoode, 1895. Size 13 × 10½, pp. liv., 1608, 32, viii., and 38. *Maps and Plates. Price (First and Second Parts) 80s. Presented by the Lords of the Treasury.*

This was reviewed in the *Journal* for April (vol. v. p. 360).

Oceanography—Temperature. *Petermanns M.* 41 (1895): 153-159. **Schott.**

Die jährliche Temperaturschwankung des Ozeanwassers. Von Dr. Gerhard Schott. *With Map.*

Dr. Schott has produced a most interesting and valuable map, which illustrates the extremes of ocean temperature from an annual range of under 1° C. in the equatorial region to over 10° C. in the enclosed seas of Europe, and off the east coasts of North America and Asia. The higher mean range in the northern hemisphere is very striking.

Photographic Surveying. **Rousson.**

Application de la Photographie au Levé de Plan. La Photogrammètrie. Par Henri Rousson. *With Illustrations.* From *Science Française* 5 (1895): 52-54.

Physical Geography. *B.S.G. Paris* (7) 16 (1895): 149-176. **Lapparent.**

La distribution des conditions physiques à la surface du globe. Par M. Albert de Lapparent. *With Maps.*

A study of the physical relations, and especially of the meteorology of the Earth's surface as a whole, designed to show the controlling power of land-forms on such phenomena, and the consequent necessity of ascertaining the method of origin of these forms.

Terrestrial and Celestial Globes. **Fiorini and Günther.**

Erd- und Himmels-globen, ihre Geschichte und Konstruktion. Nach dem italienischen Matteo Fiorinis, frei bearbeitet von Siegmund Günther. Leipzig: B. G. Teubner, 1895. Size 10 × 7, pp. vi. and 138. *Price 4 marks. Presented by the Publisher.*

We have already (vol. iv. p. 580) drawn attention to Prof. Fiorini's work. Dr. Günther has done good service in preparing a German edition, which, while a free translation of the Italian, is both more comprehensive and more precise than the original. It deals fully, for the first time in the German language, with the actual drawing of the gores for a globe, and gives the formulæ by which this has been done by the great globe-makers from the earliest times. We could have desired more numerous illustrations, both of globes and in the way of mathematical diagrams.

GENERAL.

Biographical Dictionary. **Lee.**

Dictionary of National Biography. Edited by Sidney Lee. Vol. xliii. Owens—Passelewe; Vol. xliv. Paston—Percy. London: Smith, Elder & Co., 1895. Size 10 × 7, pp. (vol. xliii.) vi. and 452; (vol. xliv.) vi. and 448. *Price of each vol. 15s.*

The following names, of geographical interest, are included among the notices in these volumes:—Vol. xliii.: John Oxley, by the late H. M. Chichester; William Gifford Palgrave, by J. A. Hamilton; John Palliser, by G. C. Boase; Edward Henry Palmer, by Stanley Lane-Poole; Sir Woodbine Parish, by Charles Parish; Mungo Park, by W. Carr; Sir Harry Smith Parkes, by S. Lane-Poole; Mansfield Parkyns, by T. Seccombe; Sir William Edward Parry, by Prof. J. K. Laughton; and Abraham Parsons, by the late H. M. Chichester.—Vol. xliv.: William Paterson, by C. A. Harris; Thomas Pellow, by T. Seccombe; Sir Lewis Pelly, by Major Broadfoot; Thomas Pennant, by W. Wroth; Joseph Barclay Pentland, by G. C. Boase; and Robert Percival, by C. R. Beazley.

Biography—Abich. **Abich.**

Aus Kaukasischen Ländern. Reisebriefe von Hermann Abich. Herausgegeben von dessen Witwe. Erster Band. Briefe aus den Jahren 1842-1853 an seine Eltern und Geschwister. Zweiter Band. Briefe aus den Jahren 1859-1874 an seine Frau. Vienna: A. Hölder, 1896 [1895]. Size 10 × 6½, pp. (vol. i.) xii. and 608; (vol. ii.) viii. and 314. *Portrait. Presented by Frau Abich.*

The widow of the famous explorer of the Caucasus, Hermann Abich, has published the family letters written by him when engaged in his Caucasian investigations. He was born in 1806, and made his first journey to the Caucasus in 1844. The first volume contains letters written to his parents and sisters from 1844 to 1853, while the second and smaller volume contains letters written to his wife from 1859 to 1874. He died in 1886. These letters give a very full and lively account of Abich's travels; many of them are of great length and full of incident, while the results of his geological investigations are given in a very readable form.

Biography—Lyell. **Bonney.**

The Century Science Series. Charles Lyell and Modern Geology. By Professor T. G. Bonney. London: Cassell & Co., 1895. Size 7½ × 5, pp. 224. *Portrait. Price 3s. 6d. Presented by the Publishers.*

Professor Bonney's biography of Lyell is designed to show how the life of the great geologist became "an apologue setting forth the beneficial results of concentrating the whole energy on one definite object, and the moral grandeur of a calm, judicial, truth-seeking spirit."

Book of Reference—Gazetteer. **Chisholm.**

Longmans' Gazetteer of the World. Edited by George G. Chisholm. London: Longmans & Co., 1895. Size 11½ × 9, pp. xii. and 1788. *Price 42s. Presented by the Publishers.*

Mr. Chisholm's *Gazetteer* supplies one of the most keenly felt wants of the practical man who requires occasional information of an exact, authoritative, and recent character as to places. It will be referred to in a special notice.

Colonization. **Dubois.**

Marcel Dubois. Systèmes coloniaux et Peuples colonisateurs. Dogmes et faits. Paris: G. Masson and E. Plon & Co, 1895. Size 7½ × 5, pp. xvi. and 290. *Price 3s.*

This is a series of thoughtful essays on the theory and history of colonization, with special reference to countries other than France, and forms the substance of a course of lectures given by Professor Dubois.

Commercial Geography—Ocean Routes. **Schott.**

Z. Ges. Erdk. Berlin **30** (1895): 235-300.

Die Verkehrswege der transozeanischen Segelschiffahrt in der Gegenwart. Von Dr. Gerhard Schott. *With Plates.*

This is an admirable piece of work coming from the German Marine Observatory in Hamburg. Dr. Schott illustrates his discussion of the routes of modern sailing ships by three maps, showing (1) the chief sailing routes of the world; (2) lines of equal duration of voyage from the Lizard, outward; (3) lines of equal duration of voyage to the Lizard, homeward; and also by a series of four synoptic weather-charts off Cape Horn in stormy weather.

Historical—Bianco's Map. *Mem. S.G. Italiana* **5** (1895): 202-225. **Errera.**

Della carta di Andrea Bianco del 1448 e di una supposta scoperta dei Brasile nel 1447. Memoria di Carlo Errera. *With two Sketch-maps.*

A critical and controversial paper, in large part occupied by considering Mr. Yule Oldham's interpretation of the inscription on the map. In the writer's opinion "1500" is really "| 500 |."

Historical—Geographical Progress. **Maunoir.**

Société de Géographie de Paris. Rapports Annuels sur les Progrès de la Géographie 1867-1892. Par C. Maunoir. Tome Premier 1867-1875. Paris: E. Leroux, 1895. Size 10 × 6½, pp. 670. *Portraits and Maps. Presented by the Author.*

M. C. Maunoir is republishing in volume form the annual reports of the progress of geography which he has compiled for the Paris Geographical Society since 1867. The first volume, coming down to 1875, presents a complete history of geographical work for the period under consideration, and its value is enormously enhanced by an index of the names of travellers and authors.

Historical—Maps. **Wauwermans.**

Histoire de l'École Cartographique Belge et Anversoise du XVI^{e} siècle. Par le Lieutenant-Général Wauwermans. 2 vols. Bruxelles: Institut National de Géographie, 1895. Size 10 × 6½, pp. (vol. i.) 402; (vol. ii.) 470. *Plates. Presented by the Author.*

This work has a much wider scope than the title indicates. It traces the growth of cartography from the earliest period, and chapters are devoted to Greek Geography, Roman Itineraries, the Progress of Navigation, Portulani, and the Geographical Renaissance in Part I. Part II. deals in seven chapters with the history of Antwerp and the state of its trade in the sixteenth century, and this completes the first volume. The second volume contains an account of the great Flemish cartographers, Gemma Frisius, Mercator, and Ortelius in Part III.; and in Part IV. deals with the lesser cartographers, Ortelianus, Hondius, and their followers. The work has been appearing in instalments in the *Bulletin* of the Antwerp Geographical Society, vols. 17 to 20, during the years 1892-1895.

Institution of Civil Engineers—Library Catalogue. ——

Catalogue of the Library of the Institution of Civil Engineers. Three vols. London: Published by the Institution, 1895. Size 8½ × 6, pp. (vol. i.) iv. and 516; (vol. ii.) iv. and 582; (vol. iii.) iv. and 582. *Presented by the Institution.*

This is a full alphabetical catalogue arranged under authors' names as far as possible, but with subject or official names in the same alphabet in the case of anonymous or official publications. The type is large, and the entries, printed across the page, have abundant space, the clearness of the references being thus a compensation for the greater bulk of the work.

Institution of Civil Engineers – Proceedings—Subject Index.

Minutes of Proceedings of the Institution of Civil Engineers. Subject Index; Volumes lix. to cxviii. Sessions 1879-80 to 1893-94. London: 1895. Size 8½ × 6, pp. iv. and 534. *Presented by the Institution.*

An alphabetical subject-index for the sixty volumes of Minutes of Proceedings published during the last fifteen sessions of the Institution of Civil Engineers, and containing references to a large number of papers of considerable geographical importance.

Languages, etc. **Cust.**

Linguistic and Oriental Essays. Written from the year 1861-1895. Fourth Series. By Robert Needham Cust, LL.D. London: Luzac & Co., 1895. Size 8½ × 6, pp. xvi. and 634. *Presented by the Author.*

This volume is divided into Part I., Linguistic, including a number of essays, obituary notices, and criticisms; Part II., India; Part III., Africa; Part IV., Religion; and Part V., Miscellaneous. It contains altogether seventy-six articles.

Mountain Railways. *P.I. Civil Engineers* **120** (1895): 2-150. **Various Authors.**

The St. Gothard Mountain Railway and the Stanzerhorn Cable-Railway.
By Sigvord Johnson Berg.
The Monistrol-Montserrat Rack-Railway. By Alfred Collett.
The Usui Mountain Railway, Japan. By C. A. W. Pownall.

This set of papers, accompanied by a long discussion, may be looked upon as a complete account of mountain railways, as almost every mountain railway in existence is referred to at one part or another of the discussion, if not in the papers.

Voyages and Travels. **Brassey.**

Voyages and Travels of Lord Brassey, K.C.B., D.C.L., from 1862 to 1894. Arranged and Edited by Captain S. Eardley-Wilmot. Two vols. London: Longmans & Co., 1895. Size 8½ × 6, pp. (vol. i.) 344; (vol. ii.) 292. *Maps. Price* 10*s*. *Presented by the Publishers.*

These interesting voyages cover a period of over thirty years, commencing with a trip to Algeria in 1862, and continuing to a voyage to India in 1894. Previously given as lectures, as letters to newspapers, or as magazine articles, the various chapters are now collected in a convenient form. The frontispiece is a map of Lord Brassey's voyages from 1856 to 1894, and the maze of coloured lines shows an amount of travelling very rarely placed to the credit of any one but a professional sailor.

NEW MAPS.

By J. Coles, *Map Curator*, R.G.S.

EUROPE.

A'gäuer Alps. **Halbfass.**

Tiefen eineger Seen der Algäuer Alpen. Von Dr. Wilhelm Halbfass. Scale 1 : 25,000 or 2·5 inches to a stat. mile. 1. Hopfensee. 2. Weissensee. 3. Alpsee. 4. Haldensee, Vilsalpsee. Petermanns 'Geographische Mitteilungen,' Jahrgang 1895. Tafel 15. Gotha: Justus Perthes. *Presented by the Publisher.*

Denmark. **Danish General Staff**

Generalstabens topografiske Kaart over Denmark. Scale 1 : 40,000 or 1·5 inch to a stat. mile. Kalkograferet og graveret ved generalstaben, Kjobenhavn, 1895. Sheets—Asaa, Dronninglund, Hals. *Presented by the Danish General Staff, through H.E. the Danish Minister.*

England and Wales. **Ordnance Survey.**

Publications since October 7, 1895.

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Carte géologique internationale de l'Europe, 49 feuilles à l'échelle de 1 : 1,500,000 or 23·6 stat. miles to an inch. La carte, votée au Congrès géologique international de Bologne en 1881, est exécutée conformément aux décisions d'une Commission internationale, avec le concours des Gouvernements, sous la direction de MM. Beyrich et Hauchecorne. Livraison I. (containing 6 sheets). Berlin : Dietrich Riemer, 1895.

These are the first six sheets of a geological map of Europe which is in course of publication, and which is being prepared in conformity with a resolution passed by the International Geological Congress of Bologne, 1881. The maps in the present issue contain Iceland, Northern Germany, and a part of Western Russia. This important map will be completed in 49 sheets. The colours are well chosen, and the registering is perfect.

Sweden. **Generalstabens topografiska afdelning, Stockholm.**

Generalstabens karta öfver Sverige. Scale 1 : 100,000 or 1·5 stat. mile to an inch. Sheet 62, Åmål.—Karta öfver Norbottens Län. Scale 1: 200,000 or 3·1 stat. miles to an inch. Sheets 34, Storafvan; 36, Boden; 43, Jörn (Boksele), Generalstabens topografiska afdelning, Stockholm. *Presented by the Topographical Section of the Swedish General Staff.*

ASIA.

Russia. **Ssibiriakóff.**

Wasserstrassen-Verbindungen in Sibirien. Nach den Projekten, von A. Ssibiriakóff. Scale 1 : 7,000,000 or 110·5 stat. miles to an inch. Petermanns 'Geographische Mitteilungen,' Jahrgang 1895. Tafel 16. Gotha : Justus Perthes, 1895.

AFRICA.

Rhodesia. **Stanford.**

A Map of Rhodesia divided into provinces and districts, under the administration of the British South Africa Company, 1895. Scale 1 : 1,000,000 or 15·8 stat. miles to an inch. Published by Edward Stanford, London. 6 sheets. *Price* 15*s*.

In the compilation of this map all the most recent and reliable material has been used. A new feature in the map is the manner in which the boundaries of districts, provinces, and native reserves are shown. The positions of gold-fields in the course of development are indicated, and all roads, railroads, and telegraph-lines are laid down. The altitudes above sea-level are given in feet, and the position of hilltops are indicated. Notes describing the nature of the country, and other items of information, appear in many parts of the map.

AMERICA.

California and Nevada. **Whitaker & Ray Co.**

New Map of California and Nevada, compiled from the latest and most reliable official sources and special surveys, 1895. Scale 1 : 760,320 or 12 stat. miles to an inch. Published by the Whitaker & Ray Co., San Francisco. 4 sheets.

The means of communication by road and rail are clearly shown on this map. It contains an inset of the congressional and senatorial districts of California. Though roughly drawn, it will be found useful for reference to those who are commercially interested in California.

Chili. **Bianconi.**

République du Chili. Scale 1 : 2,500,000 or 39·2 stat. miles to an inch. Cartes commerciales, physiques, politiques, administratives, routières ethnographiques, minières et agricoles avec Notice Descriptive comprenant les reseignements. Par F. Bianconi, Ingénieur geographe (avec la collaboration des principaux voyageurs français). Publiées par la Librairie Chaix. Chaque carte avec texte, prix cartonné. 4 *francs*.

This is the latest issue of a useful series of commercial maps which has been for some years past in course of publication. In addition to the map, a considerable amount of statistical information with regard to the exports and imports, railways, finance, commerce, etc., is given, with notes on the history, geography, and administration of Chili.

GENERAL.

Ancient Atlas. **v. Spruner-Sieglin.**

v. Spruner-Sieglin, Hand-Atlas zur Geschichte des Altertums, des Mittelalters und der Neuzeit. I. Abteilung: Atlas Antiquus. Atlas zur Geschichte des Altertums. 34 kolorierte Karten in Kupferstich enthaltend 19 übersichtsblätter, 94 historische Karten und 73 Nebenkarten. Entworfen und bearbeitet von Dr. Wilhelm Sieglin. Fünfte Lieferung. Gotha: Justus Perthes, 1895. *Price* 2·50 *marks each part.*

The present issue contains the following maps: No. 9, Imperia Persarum et Macedonum Alexandri Magni tempore; No. 10, Regna Diadochorum et Parthorum; No. 20, Mauretania, Africa, Cyrenaica; No. 27, Imperium Romanum saeculis p. Chr. secundo et tertio. In addition to the principal maps, insets are given.

Facsimile Maps. **Müller.**

Die ältesten Weltkarten. Herausgegeben und erläutert von Dr. Konrad Müller, Prof. am K. Realgymnasium in Stuttgart. III. Heft: Die kleineren Weltkarten. Mit 74 Abbildungen im Text und 4 Tafeln in Farbendruck. Stuttgart: Jos. Roth'sche Verlagshandlung, 1895.

This is the third issue of this atlas, and contains the following maps with explanatory text: I. Die beiden karten des hl. Hieronymus; II. Die Weltkarte des Heinrich von Mainz; III. Die Cottoniana; IV. Die Psalterkarte von London; V. Die Weltkarte Lamberts von St. Omer (c. 1120); VI. Die 2 Karten des Guido in Brüssel a. 1119 (gu); VII. Die Weltkarte von Albi (8 Jahrhundert); Das Erdbild des Kosmas Indopleustes; IX. Der Situs Jerusalem (11 Jahrhundert) in 8 Abschriften; X. Die Karten des Matthaeus Parisiensis, c. 1250 (Mt.); XI. Die Karten des Ranulf Higden, 1363 (8 Kopien); XII. Die Sallustkarten (Sa) [8 grössere, 6 kleinere]; XIII. Die T-Karten; XIV. Die Macrobiuskarten; XV. Karten der Klimate; XVI. Die Darstellung der Erde auf Münzen; XVII. Die Weltkarten des Marino Sanuto, Petrus Vesconte und Paulinus von Puteoli, c. 1320; XVIII. Die Weltkarte von Ste.

Géneviève in Paris, c. 1370; XIX. Die Melakarte in Reims a. 1417; XX. Die Karten des Dati a. 1422; XXI. Die Genfer Sallustkarte (15 Jahrhundert); XXII. Die Weltkarte des Andrea Bianco a. 1436; XXIII. Die Weltkarten und der Plan von Jerusalem des Johannes von Udine (1363); XXIV. Die Karte Walspergers a. 1448; XXV. Die Borgiakarte in Rom (15 Jahrhundert); XXVI. Nachtrag und verloren gegangene Karten; XXVII. Die Oxforder Karte von Palästina (13 Jahrhundert); XXVIII. Das Itinerarium Sigerics von Rom nach Canterbury a. 992 994.

The World. **Paris.**

Atlas Melin, Historique et Géographique, Spécialement établi pour les Examens du Baccalauréat et de Saint-Cyr. (No. 1.) 153 Cartes ou Plans. André Paris, Editeur, à Moulins-sur-Allier.

This atlas has been specially prepared for the use of military and university students in France. It is divided into two parts, the first of which is devoted to the historical geography of Europe from 1610 to 1895. The second part contains political, physical, and industrial maps, chiefly relating to France and her colonies. Each map is accompanied by letterpress. The present issue contains 153 maps. They are printed in colours, and care has been taken not to overcrowd them with names.

PHOTOGRAPHS.

Finland. **Ståhlberg.**

45 Photographs of Finland, taken by K. E. Ståhlberg, Helsingfors. *Presented by the Geographical Society of Finland.*

The scenery, buildings, fisheries of Finland are well illustrated by this series of photographs. The subjects have been well chosen, and the photographs themselves are remarkably good.

Greenland. **Libbey.**

194 photographs, taken by Prof. W. Libbey during his visit to the west coast of Greenland. *Presented by Prof. W. Libbey.*

This is a very complete series of photographs taken by Professor Libbey during his visit to the Arctic Regions in connection with the Peary Expedition. Many of them illustrate glacier formation on the west coast of Greenland, in addition to which there are numerous views of the Danish settlements, coast scenery, and natives. They are most creditable specimens, and will be found of great value to those interested in the study of physical geography.

St. John's, Newfoundland. **Libbey.**

10 Photographs of St. John's, Newfoundland, taken by Prof. W. Libbey. *Presented by Prof. W. Libbey.*

These photographs have been taken by Professor Libbey at St. John's, Newfoundland, and convey a very good idea of the city and the surrounding scenery.

Sandwich Islands. **Libbey.**

118 Photographs of Sandwich Islands, taken by Prof. W. Libbey. *Presented by Prof. W. Libbey.*

In this interesting series of photographs Professor Libbey has given special attention to the volcanoes and lava-beds of the Sandwich Islands, and his photographs of these would alone form a valuable accession to the Society's collection; but, in addition to these, there are numerous photographs illustrating the beautiful scenery of the islands.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

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